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**A MONOGRAPH OF THE
SOUTH ASIAN, PAPUAN, MELANESIAN
AND AUSTRALIAN FROGS
OF THE GENUS RANA.**

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A MONOGRAPH OF THE SOUTH ASIAN,
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RANA.¹ "

By G. A. BOULENGER, LL.D., D.Sc., F.R.S., etc.

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The species of the large genus *Rana*, now about 195 in number,² have long been in need of a thorough revision. In the following pages I propose to deal with those inhabiting the Indo-Malay Region, or rather Southern Asia, to which I have added the few which extend the range of the genus to the Papuan and Melanesian islands and the extreme north of Australia (Cape York). I have taken as the northern and western limit of the area dealt with a line drawn from Palestine through Northern Persia, the Hindoo-Coosh (Hindu Kush) and Karakorum mountains to and including the Yang-tse-Kiang, a limit answering better the requirements of a survey of the distribution of Tailless Batrachians than those usually adopted for other groups of animals.

The collection of the British Museum has greatly increased of late and affords ample material for the study I have undertaken; in addition to this I have received much help from Dr. Annandale, both in material and in discussing some knotty points in connexion with Indian species. * My grateful thanks are due to him.

I therefore hope and trust the detailed descriptions I have drawn up, making use of several characters hitherto neglected, will prove of lasting value for the better understanding of the species, and of their inter-relationships. The description of Frogs is much more difficult than that of Reptiles, the naked skin depriving us of the aid derived from the proportions and disposition of the shields and scales and their numerical characters; measurements of the different parts of the body are of first importance, and I have therefore prepared tables of very numerous adult or half-grown specimens, in order to convey exact information on this point, and also to show the amount of individual variation, a matter of great importance which is so often passed over.

¹ At Dr. Boulenger's request I have added notes on the habits, geographical range, etc., of species with which I am personally acquainted. These notes are enclosed in square brackets and initialled. N. Annandale.

² Nearly twice the number given in my Catalogue of 1882, after elimination of the Madagascar species which are now placed in the genera *Mantidactylus*, Blgr. and *Aglyptodactylus*, Blgr.

The time has come to rid ourselves of the empirical methods which have necessarily prevailed so long in zootaxy, and to endeavour to group species, as far as possible, according to their probable phylogenetic relationships, and for this purpose it is desirable to fix one's ideas by establishing a theoretical prototype from which phyletic lines may be drawn up. This I have recently attempted to do in a paper¹ of which an abstract is here given.

The *Firmisternia* are certainly derived from the Arcifera, as shown by their ontogeny, and among the latter the Cystignathidae agree in so many points with the Ranidae that we may legitimately assume a direct genetic relationship between them.

Dealing first with external characters, I consider the complete separation of the outer metatarsals by web as the most primitive character, which is not correlated with the degree of development of the web between the toes. In all the series of allied forms in which the phyletic tendencies are clearly indicated, we can follow the gradual reduction of the membrane; the species with fully webbed toes are, therefore, the least specialized, so far as this character is concerned.

The dilatation of the tips of the digits is a specialization culminating in the large scansorial discs of the species adapted to an arboreal life.

The primitive frog must have had a well-developed tympanum covered by a very thin skin. The reduction of the organ, which may be completely concealed under the thick skin, leads to its suppression (*R. pleskei*).

The prominent glands on the back have often a tendency to run together in longitudinal ridges, irregular at first and ultimately localized, such as the dorso-lateral fold which characterizes a great number of species. However, this fold may again disappear, as some species of *Hyloscophus* seem to show; it is therefore necessary to distinguish, from the other characters taken in conjunction, whether the absence of the fold is primary or secondary.

The skeleton affords important indications for judging of the phylogenetic relationships. I have limited myself to the use of characters which may be ascertained without difficulty on spirit specimens. Such are those derived from the skull, which can be examined by lifting up the skin, usually feebly adherent, and the pectoral arch, which can be exposed by making an incision along the breast and removing the muscles. The shape of the terminal phalanges is easily revealed by the dissection of the tip of one of the fingers or toes.

I regard as the most typical a skull such as that of *R. hexadactyla*, in which the nasals are large, and in contact with each other and with the frontoparietals, the upper surface of the ethmoid being covered over. From such a type we may derive on the one hand those forms in which the cranial roof is expanded, and

¹ *Bull. Soc. Zool. France*, 1918, p. 111.

the bones rugose and more or less confluent with the skin, on the other those in which the nasals and the frontoparietals are reduced.

Most species agree with the type of the genus, *Rana temporaria*, in having a strong, horizontal clavicle (so-called precoracoid), and a simple omosternum (episternum). But the omosternum may be forked at the base, A-shaped, and this I regard as a specialization; whilst the oblique direction of the clavicle, diverging from the coracoid towards the median line, as in a few African species, is certainly an approximation to the original condition in the Cystignathidae. The African frogs of the subgenera *Hildebrandtia* and *Ptychadena* show a high specialization in the reduction of the clavicles.

The species with simply pointed terminal phalanges I regard as the most primitive; a transverse distal expansion, which may be carried so far as to give the bone the shape of a T or a Y, in connexion with the scansorial discs, is a departure from the primitive type, and so is the claw-shaped phalanx which is characteristic of *Ptychadena*.¹

Basing our considerations on these theoretical conceptions, we find that *Rana hexadactyla* is, among Asiatic species, the nearest approach to the ideal prototype: Outer metatarsals separated, fully webbed toes, pointed fingers and toes, distinct tympanum, absence of dorso-lateral glandular fold, condition of the skull. In the shoulder girdle, with horizontal clavicles and forked omosternum, it is, however, more advanced than some of its African congeners.

I therefore start with *R. hexadactyla*, from which the series headed by *R. tigrina* and *R. grunniens* can be directly derived. How other series, corresponding to the subgenera into which the genus is divided, may be derived from *Rana, sensu stricto*, is expressed in the synopsis given further on.

Having explained the principles by which I have been guided in the classification of the species, I need hardly add that their application is not without many difficulties, which I am still unable to overcome. I trust, however, that the present arrangement constitutes a marked progress on past attempts.

A few words of explanation are necessary concerning the method of taking measurements.

The length of the head and of the snout are taken along the axis, and the posterior extremity of the head corresponds to the articulation of the skull with the vertebral column, which can be approximately ascertained, in the flesh, by feeling with the points of the compasses. The width of the head is the greatest width, at the commissures of the jaws.

The tympanum,² of which the greatest diameter is given, is compared with the eye, measured along the side of the head. The limbs are measured fully stretched out, the hind limb from the

¹ Cf. Boulenger, *C.R. Ac. Sci. Paris*, CLXV, 1917, p. 987.

² In a recent paper published in the *Records of the Indian Museum* (XV, 1918, p. 97), Mr. Bains Prashad proposes to substitute the name 'tympanic area'

middle line of the thigh where it joins the body. By foot is meant the foot without the tarsus; it is measured from the tarso-metatarsal articulation. Each finger or toe is measured from the point at which it joins its fellow, and if this is not the same on both sides, as in the case of the fourth toe, from the point most remote from the tip. The length of the first toe is reckoned from the distal extremity of the base of the inner metatarsal tubercle.

Genus *Rana*, L.

Tongue extensively free and more or less deeply notched and bifid behind. Vomerine teeth (exceptionally absent). Pupil roundish-subtriangular or horizontal, or rhombic and very contractile.¹ Fingers free, toes more or less extensively webbed (exceptionally nearly free). Omosternum and sternum with a bony style. No intercalary bone between the penultimate and distal phalanges.

Divided into 9 subgenera:—

I. Clavicles strong, straight or feebly curved, horizontal or directed forward, narrowly separated on the median line.

A. Digits not dilated at the end, or with dilatations devoid of horizontal groove.

1. Tympanum present; squamosal not forming a suture with the maxillary.

a. Outer metatarsals separated by web, at least in the distal half.

Rana, sensu stricto. Type: *R. temporaria*, L. 14 Eurasian species, 22 American, 11 African, 45 Indo-Malayan, 1 Papuan.

b. Outer metatarsals united or separated only in their distal extremity; omosternum usually forked at the base.²

Tomopterna, D. et B. Type: *T. delalandii*, D. et B. 4 Indian species, 4 African. Burrowing forms, connected with *Rana* (*R. tigrina-limnocharis* group) through the Indian *R. rufescens*, Jerd.

2. Tympanum present; squamosal forming a suture with the maxillary.

a. Outer metatarsals completely united; omosternum entire.

Pyxicephalus, Fsch. Monotype: *P. adspersus*, Tsch., Africa. Burrowing form like the preceding, probably derived from another group of *Rana*.

b. Outer metatarsals separated in the distal third or fourth; omosternum forked at the base.

Aubria, Blgr. Monotype: *R. subsigillata*, A. Dum., Africa. Probably derived from the *R. tigrina* group, like *Tomopterna*, but in a different direction.

to 'tympanum' as universally used. When we say the tympanum is distinct, we do not convey the idea that it is exposed, just as we are fully justified in stating that the eye of a frog is distinct even when the transparent lower lid is drawn over it. Mr. Baini Prashad has quoted various authors to show that "a great deal of confusion exist, regarding the tympanum being a structure distinct from the skin or otherwise." He should have referred to the introduction to my book, 'The Tailless Batrachians of Europe' (Ray Society, 1897), in which (p. 11), dealing with the external characters, I have thus described the state of things:—"The tympanum, or drum of the ear, is absent in *Bombinator* and *Pelobates*. When present it may be concealed under the skin, as in some specimens of *Discoglossus*, *Pelodytes*, and *Bufo vulgaris*, or appear on the temple behind the eye as a round or oval disk covered with thin skin."

¹ As in *R. corrugata*, *kuhlii* and *spinosa*.

² The character suffers exceptions, as Miss Procter has pointed out to me that the omosternum may be simple in specimens of *R. delalandii*. Is this to be regarded as a case of reversion to the original condition? It shows at any rate that great systematic importance cannot be attached to the shape of the omosternum.

3. No tympanum; outer metatarsals separated in the distal third or fourth; omosternum entire.

Nanorana, Gthr. Monc. type: *N. pleskei*, Gthr., Kashmir and Thibet. Connected with the *R. liebighii* group through *R. blanfordii*, Blgr.

- B. Toes, often also fingers, dilated at the end, the dilatation, or disc, bearing a crescentic or horseshoe-shaped horizontal groove.

1. Outer metatarsals united or separated only in the distal third; omosternum forked at the base.

Discodeles, Blgr. Type: *R. guppyi*, Blgr. 6 Indo-Malayan species, 3 Melanesian. Connected with *Rana* (*R. grunniens* group); leads to the Indo-Malayan, Papuan, and Melanesian genera *Cornufer*, Tsch., and *Platymantis*, Gthr.

2. Outer metatarsals separated at least in the distal half; omosternum entire.

Hylorana, Tsch. Type: *R. erythraea*, Schleg. 58 South Asian species, 1 African, 5 Papuan and Melanesian. Completely connected with *Rana* (*Ranae typicae*); leads to the Indo-Malayan genera *Staurois*, Cope, and *Simomantis*, Blgr.¹

- II. Clavicles very slender, curved or directed obliquely backwards, widely separated on the median line.

- A. Outer metatarsals united; omosternum entire.

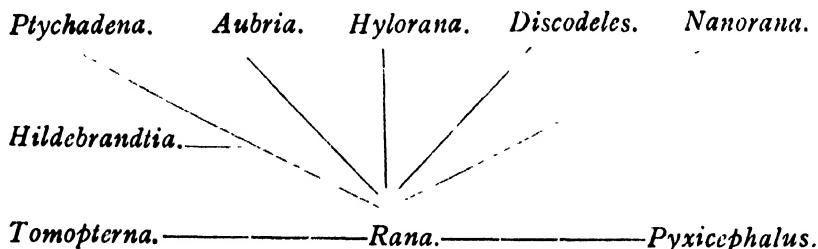
Hildebrandtia, Nieden. Type: *R. ornata*, Peters. 7 species from Africa. Burrowing forms.

- B. Outer metatarsals separated; omosternum forked at the base, distal phalanges claw-shaped.

Ptychadena, Blgr. Type: *R. mascareniensis*, D. et B. 16 species from Africa.

These two last subgenera are probably derived, as divergent series, from a common ancestral type connected with the subgenus *Rana*.

The following diagram expresses the relations between these subgenera, as I conceive them.



Subgenus *Rana*, s. str.

SYNOPSIS OF THE SPECIES.

- I. Dorso-lateral glandular fold absent or, if present, not connected with the supratemporal fold; outer metatarsals separated at least in the distal half.

- A. Tympanum very distinct, smooth; nasal bones in contact with each other, with two exceptions²; omosternal style forked at the base.

1. Inner metatarsal tubercle small but very prominent, pointed, digitiform; fingers pointed; toes webbed to the tips; male with external vocal sacs.

Vomerine teeth in strong oblique series in the adult; first finger longer than second; toes pointed; tibia

2 to 2½ times as long as broad; throat and belly with granules and small warts

.. *R. hexadactyla*, Less.

¹ Cf. Boulenger, *Ann. and Mag. N. H.* (9) 1, 1918, p. 372.

² *R. microdisca* and *palawanensis*.

Vomerine teeth in small groups; first and second fingers equal; tips of toes swollen or dilated into very small discs; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad; throat and belly usually smooth ...

R. cyanophlyctis, Schn.

2. Inner metatarsal tubercle small or large, blunt or compressed, not digitiform; toes $\frac{1}{2}$ to entirely webbed.

a. Toes with obtuse or slightly swollen tips; vomerine teeth between the choanae, often extending posteriorly beyond them; male with a more or less developed pad on the inner finger.

a. No outer metatarsal tubercle; toes $\frac{1}{2}$ to entirely webbed; first finger longer than second; tibia $2\frac{1}{2}$ to 3 times as long as broad; male with external vocal sacs.

Toes completely webbed; tibio-tarsal articulation reaching tip of snout ...

R. verruculosa, Roux.

Toes completely or nearly completely webbed; tibio-tarsal articulation not reaching tip of snout ...

R. tigrina, Daud.

Toes incompletely webbed, or with the web deeply notched; tibio-tarsal articulation not reaching tip of snout ...

R. cancrivora, Gravh.

β. Usually a more or less distinct outer metatarsal tubercle.

* Toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed; tibia $3\frac{1}{2}$ to 4 times as long as broad; head and back rough with warts of unequal size; male with internal vocal sacs ...

R. verrucosa, Gthr.

** Toes usually not more than $\frac{1}{2}$ webbed, rarely $\frac{3}{4}$; male with external vocal sacs.

Toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad; tibio-tarsal articulation not reaching beyond tip of snout; first finger longer than second ...

R. limnocharis, Wieg.

Toes not quite $\frac{1}{2}$ webbed; tibia 3 to 4 times as long as broad; tibio-tarsal articulation not reaching tip of snout; first finger not or but very slightly longer than second ...

R. greenii, Blgr.

Toes barely $\frac{1}{2}$ webbed; tibia 4 to $4\frac{1}{2}$ times as long as broad; tibio-tarsal articulation reaching tip of snout or beyond; first finger longer than second ...

R. brevipalmata, Peters.

b. Toes with the tips dilated into distinct discs; male without or with internal vocal sacs, without enlargement of the fore limb or inner finger, often with tooth-like bony processes in front of lower jaw.

a. Vomerine teeth extending behind level of choanae, or entirely behind them.

* Tibia 3 to 4 times as long as broad; nasal bones large and in contact with each other and with the frontoparietals.

† Toes $\frac{1}{2}$ to entirely webbed; interorbital region flat.

§ First finger much longer than second.

Tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; tibia more than twice in length from snout to vent; heels not overlapping; male without vocal sacs, without tooth-like processes in lower jaw ...

R. grunniens, Daud.

Tympanum $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye; tibia $1\frac{1}{2}$ to $2\frac{1}{2}$ times in length from snout to vent; heels overlapping; discs of toes very small, male without vocal sacs, with tooth-like processes in lower jaw ...

R. macrodon, D. et B.

Tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; tibia 2 to $2\frac{1}{2}$ times in length from snout to vent; heels not overlapping; discs of toes rather large; male with vocal sacs, with tooth-like processes in lower jaw ...

R. magna, Stejn.

Tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; tibia nearly 2 to $2\frac{1}{2}$ times in length from snout to vent; heels overlapping; discs of toes very small; male with vocal sacs, with tooth-like processes in lower jaw ...

R. modesta, Blgr.

§§ First finger not much longer than second.

Tympanum $\frac{1}{2}$ size of eye; first finger as long as or a little shorter than second ...

[v. Kamp.
R. microtympanum,

Tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye ; first finger a little longer than second ; tibia $1\frac{1}{2}$ to $2\frac{1}{2}$ times in length from snout to vent ; heels overlapping ; male without vocal sacs, without tooth-like processes in lower jaw

R. doriae, Blgr.

†† Toes $\frac{3}{4}$ to nearly entirely webbed ; male with the interorbital region very convex, swollen behind, with tooth-like processes in the lower jaw, no vocal sacs, and the tympanum as large as or a little larger than the eye.

Tibia at least twice in length from snout to vent ; inner metatarsal tubercle $\frac{1}{2}$ to $\frac{3}{4}$ length of inner toe ; interorbital swelling of male rounded behind

R. macrognathus, Blgr.

Tibia at least twice in length from snout to vent ; inner metatarsal tubercle $\frac{1}{2}$ to $\frac{3}{4}$ length of inner toe ; interorbital swelling of male followed by a dermal flap

R. pileata, Blgr.

Tibia $1\frac{1}{2}$ to 2 times in length from snout to vent ; inner metatarsal tubercle about $\frac{1}{2}$ length of inner toe ; back with 8 or 10 glandular longitudinal folds ; interorbital swelling of male followed by a knob-like prominence

R. plicatella, Stol.

††† Toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed ; tibia $1\frac{1}{2}$ to 2 times in length from snout to vent.

Tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye ; inner metatarsal tubercle feebly prominent, $\frac{2}{3}$ to $\frac{3}{4}$ length of inner toe ; male without vocal sacs, without tooth-like prominences in lower jaw

R. hascheana, Stol.

Tympanum $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye ; inner metatarsal tubercle very prominent, $\frac{2}{3}$ to $\frac{3}{4}$ length of inner toe ; male with vocal sacs and tooth-like prominences in lower jaw

R. limborgii, W. Schl.

* Tibia 4 to 5 times as long as broad, less than twice in length from snout to vent ; toes $\frac{3}{4}$ to $\frac{1}{2}$ webbed ; first finger as long as or a little longer than second ; nasal bones moderately large and separated from each other.

No dorso-lateral fold ; male without vocal sacs, with rather small tooth-like prominences in lower jaw

R. microdisca, Boettg.

A dorso-lateral fold ; male with vocal sacs, without tooth-like prominences in lower jaw

R. palavanensis, Blgr.

B. Vomerine teeth in nearly transverse series on a level with the posterior borders of the choanae ; nostrils close to the tip of the snout ; tympanum $\frac{1}{2}$ diameter of eye ; first finger longer than second ; toes nearly entirely webbed

R. narina, Stejn.

B. Tympanum hidden or but feebly distinct ; tips of toes dilated into more or less distinct discs ; male without vocal sacs, without enlargement of the fore limb, with large tooth-like prominences in front of lower jaw ; nasal bones in contact with each other ; omosternal style forked at the base.

Tibio-tarsal articulation reaching temple or posterior border of eye ; heels not meeting ; tibia 2 to $2\frac{1}{2}$ times as long as broad, $2\frac{1}{2}$ to $2\frac{1}{2}$ times in length from snout to vent ; toes entirely webbed ; first finger usually a little shorter than second

R. corrugata, Peters.

Tibio-tarsal articulation reaching temple or eye ; heels meeting or not ; tibia $2\frac{1}{2}$ to 3 times as long as broad, 2 to $2\frac{1}{2}$ times in length from snout to vent ; toes entirely or nearly entirely webbed ; first finger as long as or a little longer than second

R. kuhlii, D. et B.

Tibio-tarsal articulation reaching beyond eye ; heels overlapping ; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to 2 times in length from snout to vent ; toes $\frac{3}{4}$ to nearly entirely webbed ; first finger as long as or a little longer than second

R. laticeps, Blgr.

C. Tympanum hidden or only moderately distinct ; no tooth-like processes in front of lower jaw ; omosternal style not forked at the base.

.I. Tibio-tarsal articulation not reaching beyond eye ; no dorso-lateral fold ;

toes entirely or nearly entirely webbed; breeding male with much thickened fore limb and horny spinules on the inner fingers and on the breast.

a. Tympanum distinct; a tarsal fold; male with internal vocal sacs.

a. Tibio-tarsal articulation reaching eye; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad, twice in length from snout to vent.

First finger longer than second; tips of toes not swollen; inner metatarsal tubercle $\frac{2}{3}$ length of inner toe ...

R. feae, Blgr.

First and second fingers equal; tips of toes slightly dilated; inner metatarsal tubercle compressed, sharp-edged ...

R. yunnanensis, And.

First finger slightly longer than second; tips of toes swollen; inner metatarsal tubercle $\frac{2}{3}$ length of inner toe ...

R. tibetana, Blgr.

b. Tibio-tarsal articulation reaching temple or posterior border of eye; tibia 3 to $3\frac{1}{2}$ times as long as broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent; first finger as long as or a little shorter than second; tips of toes obtuse or slightly swollen; inner metatarsal tubercle $\frac{2}{3}$ to $\frac{1}{2}$ length of inner toe ...

R. sternosignata, Murr.

b. Tympanum hidden or very indistinct; first finger longer than second.

Tibio-tarsal articulation reaching shoulder or tympanum; tibia $2\frac{1}{2}$ times as long as broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent; heels not overlapping; tips of toes not swollen; inner metatarsal tubercle $\frac{1}{2}$ length of inner toe; male with internal vocal sacs ...

R. phrynoides, Blgr.

Tibio-tarsal articulation reaching eye; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad, about twice in length from snout to vent; heels overlapping; tips of toes swollen; inner metatarsal tubercle $\frac{1}{2}$ length of inner toe; male with internal vocal sacs ...

R. spinosa, David.

Tibio-tarsal articulation reaching eye; tibia $1\frac{1}{2}$ to nearly 2 times in length from snout to vent; heels overlapping; tips of toes swollen; inner metatarsal tubercle $\frac{1}{2}$ length of inner toe; male without vocal sacs ...

R. gammiei, And.

II. Tibio-tarsal articulation reaching nostril, tip of snout, or beyond; heels overlapping; tibia 3 to 4 times as long as broad; $1\frac{1}{2}$ to 2 times in length from snout to vent; first finger as long as or a little shorter than second; tips of toes swollen.

a. Male with much thickened fore limb, with horny spinules on the inner finger and on the breast.

Head a little broader than long; tympanum feebly distinct; toes $\frac{1}{2}$ webbed; dorso-lateral fold distinct only in front; male without vocal sacs ...

R. annandalii, Blgr.

Head much broader than long; tympanum hidden or very indistinct; toes entirely webbed; a dorso-lateral fold usually distinct; male with internal vocal sacs ...

R. liebigii, Gthr.

b. Male with fore limb not much thickened, without spinules, without vocal sacs; head a little broader than long.

Tympanum distinct; toes entirely webbed; a feeble dorso-lateral fold ...

R. assamensis, W. Scl.

Tympanum hidden; toes entirely webbed; no dorso-lateral fold ...

R. vicina, Stol.

Tympanum very indistinct; toes $\frac{1}{2}$ to $\frac{1}{4}$ webbed; no dorso-lateral fold ...

R. blanfordii, Blgr.

II. A glandular dorso-lateral fold,¹ connected with the supratemporal fold; tympanum very distinct, smooth.

A. Omosternal style not forked at the base.

I. Outer metatarsals separated nearly to the base.

a. Canthus rostralis very obtuse or indistinct; interorbital space much

¹ Absent or indistinct in some specimens of *R. grahmi* and *R. malabarica*.

- narrower than the upper eyelid; tibia 3 to 4 times as long as broad; nasal bones large and in contact with each other or narrowly separated.
- Fingers pointed; toes entirely webbed; male with internal vocal sacs ... *R. plancyi*, Lataste.
- Fingers obtuse or obtusely pointed; toes $\frac{3}{4}$ to entirely webbed; male with external vocal sacs ... *R. esculenta*, L.
- Fingers obtusely pointed; toes $\frac{1}{2}$ webbed; male with external vocal sacs and a very large flat gland on the side of the body ... *R. pleuraden*, Blgr.
- b. Canthus rostralis distinct; interorbital space at least $\frac{1}{2}$ the width of the upper eyelid; nasal bones small and widely separated from each other; male with internal vocal sacs.
- Head as long as broad or a little broader; tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; tibio-tarsal articulation reaching tip of snout or a little beyond; tibia 3 to 4 times as long as broad; toes entirely webbed ... *R. grahami*, Blgr.
- Head as long as broad or a little broader; tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; tibio-tarsal articulation reaching nostril, tip of snout, or a little beyond; tibia 4 to $5\frac{1}{2}$ times as long as broad; toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed ... *R. japonica*, Gthr.
- Head longer than broad; tympanum $\frac{3}{8}$ to $\frac{1}{2}$ diameter of eye; tibio-tarsal articulation reaching beyond tip of snout; tibia $5\frac{1}{2}$ to 6 times as long as broad; toes $\frac{1}{2}$ webbed ... *R. longicrus*, Stejn.
- II. Outer metatarsals bound together in their basal third or half; tibia 4 to $4\frac{1}{2}$ times as long as broad; tibio-tarsal articulation reaching anterior border of eye or between eye and tip of snout; toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed; tympanum $\frac{3}{8}$ to $\frac{1}{2}$ diameter of eye.
- Heels strongly overlapping; inner metatarsal tubercle compressed, very prominent, $\frac{3}{8}$ to $\frac{1}{2}$ length of inner toe ... *R. lateralis*, Blgr.
- Heels not overlapping; inner metatarsal tubercle less than $\frac{1}{2}$ length of inner toe ... *R. okinavana*, Boettg.
- B. Omosternal style forked at the base; outer metatarsals united in their basal half; tibia $3\frac{1}{2}$ to 4 times as long as broad; tibio-tarsal articulation reaching tympanum or eye; toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed; tympanum $\frac{3}{8}$ to once diameter of eye; male with external vocal sacs and a humeral gland ... *R. malabarica*, Tsch.

The synopsis is not an artificial key merely for the ready identification of the species; although I trust it will answer that most important purpose, it also aims at conveying the expression of what I conceive to be the true relationships from a phyletic standpoint. These relationships are best expressed by the following attempt at grouping the species into natural sections:—

A. RANÆ HEXADACTYLÆ. The most generalized type, from which the three following sections, as well as the genus *Oxyglossus*, may be conceived to have been derived.

R. hexadactyla, *R. cyanophlyctis*.

B. RANÆ TIGRINÆ. Lead to *Tomopterna*.

R. verruculosa, *R. cancrivora*, *R. tigrina*, *R. verrucosa*, *R. limnocharis*, *R. greenii*, *R. brevipalmata*.

C. RANÆ GRUNNIENTES. Lead to *Discodeles*.

R. grunniens, *R. macrodon*, *R. magna*, *R. modesta*, *R. microtympanum*, *R. doriae*, *R. macrognathus*, *R. pileata*, *R. plicatella*, *R. hascheana*, *R. limborgii*, *R. microdisca*, *R. palavanensis*, *R. narina*,

D. RANÆ KUHLIANÆ. Lead to the genus *Nyctibatrachus*.

R. corrugata, *R. kuhlii*, *R. laticeps*.

E. RANÆ LIEBIGIANÆ. Derived from some primitive type, unknown.¹ Leads to *Nanorana*.

R. feae, *R. yunnanensis*, *R. tibetana*, *R. sternosignata*, *R. spinosa*, *R. phrynoides*, *R. gammiei*, *R. liebigii*, *R. annandalii*, *R. assamensis*, *R. vicina*, *R. blanfordii*.

F. RANÆ TYPICÆ. The group characteristic of the Eurasian and North American regions, of which the *Ranæ catesbiana* probably represent the most primitive type. Lead to *Hylorana*.

R. plancyi, *R. esculenta*, *R. pleuraden*, *R. grahami*, *R. japonica*. *R. longicrus*, *R. lateralis*, *R. okinavana*.

G. RANÆ MALABARICÆ. Probably derived from the preceding; a second species (*R. galamensis*) in Africa.

R. malabarica.

I. *Rana hexadactyla*.

Rana grunniens, part., Daud, *Hist. Rain. Gren. Crap.* p. 65 (1803), and *Hist. Rept.* VIII, p. 127 (1803).

Rana hexadactyla, Lesson, in Bélanger, *Voy. Ind. Or., Rept.* p. 331 (1834); Tschudi, *Class. Batr.* pp. 40, 85 (1838); Günth., *Cat. Batr. Sal.* p. 11 (1858), and *Rept. Brit. Ind.* p. 405 (1864); Steind., *Novara, Amph.* p. 19 (1867); Günth., *Proc. Zool. Soc.* 1875, p. 568; Boulenger, *Cat. Batr. Ecaud.* p. 17 (1882), and *Faun. Ind., Rept.* p. 441 (1890); Ferguson, *Journ. Bomb. N.H. Soc.* XV, 1904, p. 500, pl. A, fig. 2; Annand. and Rao, *Rec. Ind. Mus.* XV, 1918, p. 31, pl. ii, fig. 2.

Dactylethra bengalensis, Lesson, *Ill. Zool.* pl. xlvii (1834).

Rana cutipora, Dum. et Bibr., *Erp. Gén.* VIII, p. 339 (1841).

Rana robusta, Blyth, *Journ. As. Soc. Beng.* XXII, 1854, p. 298.

? *Rana neweraellia*, Kelaart, *Prodr. Faun. Zeyl.* I, p. 292 (1852).

Vomerine teeth in strong oblique series from the inner anterior corners of the choanae to a little beyond the level of their posterior borders; less developed in the young, in which they form short oblique series or small groups just behind the level of the posterior borders of the choanae. The cornua at the back of the tongue longer and more pointed than usual in the genus, often with a median process between them.

Form robust, body not at all constricted at the waist.

Head as long as broad or broader than long, much depressed; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, longer than the eye in the adult; canthus rostralis indistinct; loreal region very oblique, feebly concave; nostril nearer the end of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which is much less than that of the upper eyelid; tympanum distinct, $\frac{2}{3}$ to once the diameter of the eye, $1\frac{1}{2}$ to 4 times as long as its distance from the latter.

¹ Of which the Erithrean-Abyssinian *R. beccarii*, Blgr. is perhaps the nearest surviving representative.

Fingers slender, pointed, with a more or less distinct dermal border, first longer than second, third longer than the snout; sub-articular tubercles small, feebly prominent.

Hind limb thick, moderately long, the tibio-tarsal articulation reaching the tympanum or the eye, the heels meeting or not when the limbs are folded at right angles to the body; tibia 2 to $2\frac{1}{2}$ times as long as broad, $2\frac{1}{4}$ to $2\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb or than the foot. Toes pointed, with very broad web reaching the tips, the free border almost rectilinear; the fourth toe not extending very much beyond the third and fifth; outer metatarsals separated nearly to the base; subarticular tubercles very small or indistinct; a strong dermal fringe on the outer toe; tarsal fold slightly distinct or absent; a small but very prominent, pointed, digitiform inner metatarsal tubercle,¹ its base about $\frac{1}{3}$ the length of the inner toe; no outer tubercle.

Skin smooth above, with small porous warts on the sides; a strong fold from the eye to the shoulder, more or less distinctly connected with its fellow across the head just behind the eyes. Lower parts more or less distinctly granulate, with enlarged porous warts on the throat and under the thighs, and with a curved series of porous warts (sensory organs) along each side of the belly, and another near the flanks.

Adult olive or dark brown above, sometimes with a yellow vertebral streak, or with a yellowish lateral band from behind the shoulder to the groin. Young with two or three yellowish bands along the back, in addition to the lateral band. Lower parts white, the thighs usually striped black and white, the black stripes two or three in number.

Males with a white external vocal sac on each side, projecting through a slit close to the posterior third of the mandibular ramus, the slit as long as or a little longer than the eye; no other secondary sexual characters.²

Nasal bones large, in contact with each other and with the frontoparietals, which are narrow and grooved along the sagittal suture; ethmoid entirely covered over in the adult; zygomatic branch of squamosal very long. Omosternal style forked at the base. Terminal phalanges obtusely pointed.

The tadpole has been described and figured by Ferguson and by Annandale and Rao, and I have also examined specimens from Cochín. Tail 2 to $2\frac{2}{3}$ times as long as body, acutely pointed, with the dorsal crest extending on the body. Beak white, broadly edged with black; lip forming two lobes on each side; only one series of horny teeth in the upper lip, marginal; two or three on the lower lip, the outer marginal, all, or only the outer, uninterrupted.

¹ Containing 3 or 4 ossicles on end.

² As observed by Ferguson in *R. cyanophlyctis*, the male does not clasp the female in the manner our European frogs do, but digs the hands into the axils.

Measurements in millimetres.

	1. ♂	2. ♀	3. Hgr.	4. ♂	5. ♀	6. ♀	7. ♀	8. ♀
From snout to vent..	93	130	48	65	115	104	59	60
Head ..	30	39	18	23	35	33	20	20
Width of head ..	35	50	18	26	42	41	21	20
Snout ..	11	14	6	8	12	11	7	7
Eye ..	8	10	6	7	10	9	7	7
Interorbital width ..	3	5	2	2.5	4	3.5	2	2
Tympanum ..	6	7	4	6	9	7	4	4
Fore limb ..	51	70	27	37	60	57	32	30
First finger ..	11	16	7	9	14	14	7	7
Second finger ..	10	13	6	8	11	11	6	6
Third finger ..	13	17	8	11	16	15	8	9
Fourth finger ..	9	13	5	8	11	11	6	6
Hind limb ..	145	190	72	98	153	148	84	84
Tibia ..	42	55	21	28	45	43	25	25
Foot ..	46	61	26	34	51	52	30	30
Third toe ..	29	38	17	20	32	30	18	18
Fourth toe ..	42	53	23	29	45	45	25	26
Fifth toe ..	35	46	19	23	37	37	21	22

1—2. Madras. 3. Malabar. 4—7. Ceylon. 8. S. Ceylon.

Habitat.—Southern India and Ceylon.

[In life the adult of this species has the back of a bright leaf-green colour, with the mid-dorsal streak, if present, primrose-yellow. In half-grown individual the colours are paler and the conspicuous spots of the young frequently persist.

The locality "Puri" given by Mr. Narayan Rao and myself (*Rec. Ind. Mus.* XV, p. 31) is probably incorrect, being based on somewhat faded specimens of tadpoles from running water (see my note on *R. cyanophlyctis*). On a recent tour through the eastern districts of the Madras Presidency I failed to find *R. hexadactyla* north of Nellore.

This frog usually lives amongst dense aquatic vegetation, in which its green colour conceals it admirably. In Madras it is eaten by Frenchmen, being captured by means of a hook baited with a red rag and pulled on a line through the weeds it frequents. *N. A.*].

2. *Rana cyanophlyctis*.

Rana cyanophlyctis, Schneid.; *Hist. Amph.* I, p. 137 (1799); Peters, *Mon. Berl. Ac.* 1863, p. 78; Günth., *Rept. Brit. Ind.* p. 406 (1864); Steind., *Novara, Amph.* p. 20 (1867); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 102; Blant., *Zool. E. Persia*, p. 433 (1876); Bouleng., *Cat. Batr. Ecaud.* p. 17 (1828), and *Faun. Ind., Rept.* p. 442 (1890); Murray, *Zool. Sind.*, p. 398 (1884); Anders., *Proc. Zool. Soc.* 1895, p. 660, pl. xxxvii. fig. 2; Ferguson, *Journ. Bomb. N.H. Soc.* XV, 1904, p. 500; Bouleng., *Faun. Mal. Pen., Rept.* p. 228 (1912); Annand. and Rao, *Rec. Ind. Mus.* XV, 1918, p. 30, fig.

Rana bengalensis, Gray, *Ind. Zool.* I, pl. lxxxii, fig. 2 (1834); Kelaart, *Prodr. Faun. Zeyl.* I, p. 192 (1852).

Rana leschenaultii, Dum. et Bibr., *Erp. Gen.* VIII, p. 342 (1841); Cantor, *Cat. Mal. Rept.* p. 138 (1847); Günth., *Cat. Bat. Sal.* p. 11 (1858).

Dicroglossus adolfi, Günth., *Proc. Zool. Soc.* 1860, p. 158, pl. xxviii, fig. B, and *Rept. Brit. Ind.* p. 402 (1864).

Rana ehrenbergii, Peters, *Mon. Berl. Ac.* 1863, p. 70; Bouleng., *Cat. Batr. Ecaud.*, p. 18.

Vomerine teeth in small, round or oblique groups on a level with the posterior borders of the choanae or just behind them, equally distinct from each other and from the latter, or closer together. Tongue as in the preceding species.

Form less robust than in the preceding, with more distinct waist.

Head broader than long, rarely as long as broad, much depressed; snout rounded or very obtusely pointed, scarcely projecting beyond the mouth, as long as or longer than the eye; canthus rostralis indistinct; loreal region very oblique, feebly concave; nostril equally distant from the eye and from the end of the snout, or a little nearer the former; distance between the nostrils equal to or a little greater or a little less than the inter-orbital width, which is usually much narrower than (not more than half) that of the upper eyelid; tympanum $\frac{2}{3}$ to nearly once the diameter of the eye, $1\frac{1}{2}$ to 5 times as long as its distance from the latter.

Fingers more or less pointed, with a more or less distinct dermal border, first and second equal, third longer than the snout; subarticular tubercles small, feebly prominent.

Hind limb rather thick, moderately long, the tibio-tarsal articulation reaching the tympanum, the eye, or between the eye and the nostril, the heels meeting or not when the limbs are folded at right angles to the body; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad, 2 to $2\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb or than the foot. Toes with the tips swollen or dilated into very small discs, with very broad web reaching the tips, the free border very feebly emarginate; the fourth toe not extending very much beyond the third and fifth; outer metatarsals separated nearly to the base; subarticular tubercles very small, feebly prominent; a strong dermal fringe on the outer toe; tarsal fold feeble or absent; a small but very prominent, pointed, digitiform inner metatarsal tubercle, its base $\frac{1}{4}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin of upper parts with large pores, smooth or granular, often with small warts which may be tipped with minute asperities; a strong fold from the eye to the shoulder, often connected with its fellow across the head just behind the eyes. Lower parts smooth.

Greyish or olive above, with dark olive round spots or marblings; a more or less distinct dark, light-edged band along each flank, and on the front and back of the thighs, often disappearing in the adult; spots not forming complete cross-bands on the limbs. Lower parts white, marbled spotted, dotted or vermiculated with blackish.

Males with a grey or blackish external vocal sac on each side, projecting through a slit close to the posterior half of the mandibular ramus, the slit as long as or a little longer than the eye; no other secondary sexual characters.

Skeleton as in *R. hexadactyla*, but nasal bones smaller and terminal phalanges of toes a little expanded at the end.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	
From snout to	♂	♀	♀	♀	♂	♂	♂	♀	♀	♀	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀	♂	♂	♀	♀	♂	♂	♀	♀	♂	♂	♀	♀	♂	♂	♀	♀	
vent	66	92	88	75	57	64	60	85	64	55	47	47	46	45	74	68	60	65	60	45	39	44	47	62	42	55	54	40	50	45	64	61	40	38	60	56	
Head	..	21	31	30	26	20	21	28	21	19	16	17	17	16	25	23	21	21	20	16	14	15	16	20	15	20	20	14	15	21	20	14	14	20	19		
Width of head..	24	38	36	30	23	25	25	33	25	22	17	19	19	18	28	25	23	24	22	17	15	16	17	21	16	22	21	15	17	16	23	22	14	15	21	19	
Snout	..	7	12	10	9	7	7	9	8	6	5	5	5	5	6	10	8	7	8	7	5	5	5	6	7	5	7	7	4	5	5	5	5	5	6	6	
Eye	..	7	8	8	7	7	7	9	7	6	5	5	5	5	5	7	6	6	6	5	5	5	5	5	6	5	6	6	4	5	5	5	5	5	6	6	
Interorbital	..	2	3	5	4	3	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	1	1	1	2	2	2	1	1	1	2	2	1	1	5	2	
width	..	4	5	6	6	6	6	6	5	4	3	5	3	3	5	5	4	5	5	4	3	3	5	4	5	3	5	4	3	5	4	5	3	3	4	5	
Tympanum	..	38	55	52	47	34	38	50	35	32	25	24	26	26	40	37	34	35	34	26	20	24	25	34	24	33	31	21	25	27	38	34	24	22	32	30	
Fore limb	..	8	12	12	10	7	7	10	8	7	6	5	5	5	8	8	7	8	8	6	4	6	6	6	7	5	7	7	4	5	5	5	9	7	5	4	8
First finger	..	8	12	12	10	7	7	10	8	7	6	5	5	5	8	8	7	8	8	6	4	6	6	6	7	5	7	7	4	5	5	5	9	7	5	4	8
Second finger	..	10	14	14	12	9	9	9	13	10	9	7	6	6	10	10	9	10	10	7	5	7	8	10	6	9	9	9	5	6	7	11	9	6	5	10	9
Third finger	..	8	12	12	10	7	7	10	7	6	5	5	4	5	7	8	6	7	7	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Fourth finger	..	94	130	130	107	90	95	92	124	95	88	70	67	70	68	99	93	85	93	87	71	52	68	71	90	66	83	78	60	70	73	98	86	64	61	87	78
Hind limb	..	29	41	40	34	28	30	29	39	29	27	22	20	21	32	30	26	29	27	22	16	20	22	27	20	25	24	19	21	22	30	27	20	19	26	23	
Tibia	..	32	44	45	37	31	32	31	42	32	30	24	22	22	35	33	30	32	30	24	17	24	24	30	22	29	27	20	23	24	32	29	22	21	30	27	
Foot	..	20	30	30	24	19	19	19	25	20	18	16	14	14	15	20	17	20	20	16	11	15	15	19	13	18	18	12	14	16	20	18	13	13	20	16	
Third toe	..	26	39	39	32	25	27	26	35	27	26	20	18	19	19	29	27	26	27	26	21	13	20	26	19	24	23	16	18	21	27	25	18	18	25	22	
Fourth toe	..	21	32	32	26	22	21	21	29	22	21	17	15	16	16	23	21	21	23	22	17	11	16	16	21	16	21	16	14	15	17	21	20	15	21	18	
Fifth toe	..	21	32	32	26	22	21	21	29	22	21	17	15	16	16	23	21	21	23	22	17	11	16	16	21	16	21	16	14	15	17	21	20	15	21	18	

1-4. Aithalhim, near Aden. 5. Abian country, S. Arabia. 6-8. Upper Hushabi, S. Arabia. 9-10. Pishin, Baluchistan. 11. Quetta, Baluchistan. 12-17. S. Waziristan, Afghanistan, 4500 f. 18-19. Kashmir. 20. Bhim Tal, Kamaon Himalayas, 4500 f. 21. Simla, Himalayas (type of *Diuroglossus adolfi*). 22-23. Pharping, Nepal. 24. Nepal. 25-27. Benares. 28-29. Trevandrum, Travancore. 30-32. Piermud, Travancore. 33-36. Ceylon.

Tadpole with the tail $1\frac{1}{2}$ to 2 times as long as the body, pointed, the dorsal crest extending on the body. Beak entirely black, surrounded by a large circular lip, with a single, marginal, series of horny teeth in front, and two series behind, both uninterrupted.¹ Size large (up to 100 milim. or more).

Eggs small, 1 to $1\frac{1}{2}$ milim. in diameter.

Habitat. South Arabia, Baluchistan, Afghanistan, Himalayas up to 6,000 ft., India and Ceylon. The occurrence of this species in the Malay Peninsula (*vide* Cantor) is very doubtful.

There is something wrong in Duméril and Bibron's description of *R. leschenaultii*, as the belly is stated to be 'percé de pores disposés en lignes,' as in *R. hexadactyla*, which is not the case in any of the specimens examined by me. I have examined the type specimens, nine in number, in the Paris Museum, and find in two of them a short series of pores on each side of the posterior part of the belly. The usual absence of the series of small porous warts on the lower parts is one of the most striking characters distinguishing *R. cyanophlyctis* from *R. hexadactyla*.

[The tadpoles of this species are plastic and vary considerably with their environment. Those from the edge of streams are more slender and smaller than those from still water. The former can often be distinguished from the tadpoles of *R. hexadactyla* by little but colour.

I have recently described the manner in which *R. cyanophlyctis* skips over the surface of the water (*Rec. Ind. Mus.* XVI, p. 122)—a habit first noticed by the Emperor Babur in the 16th century and wrongly attributed in recent times to *R. limnocharis*, the structure of the feet of which is quite unsuitable.

The geographical range of *R. cyanophlyctis* extends along the Mekran Coast into Persian Baluchistan, where Blanford's specimens were obtained. It is also common in the Quetta hills up to at least 6,000 feet. I failed to find it in the Baluchistan desert or in Seistan, but Nikolsky has described a race from the latter country. I have seen no specimens from Burma and the species is evidently very scarce in the Malay Peninsula, in which it is probably confined to the northern districts. There can, however, be no doubt as to its occurrence in Peninsular Siam, where I captured a perfectly typical specimen: see *Mem. As. Soc. Bengal* VI, p. 45.

At Quetta I have seen frogs of this species floating with *R. sternosignata* on the surface of a pond the edge of which was frozen. They seemed fairly active, but did not skip. This habit of skipping, however, seems to be less well-developed, as I have noticed both in the Nilgiris and Himalayas, among individuals living at high altitudes than in those in the plains. Hill specimens, moreover, are usually smaller than plains specimens, but this is not the case at Quetta.—*N. A.*].

¹ According to Annandale and Rao, the condition of the rows of horny teeth is variable; they figure a specimen with a single short row on each side of the upper lip and a short inner row on each side of the lower.

3. *Rana verruculosa*.

Rana tigrina var. *verruculosa*, Roux, Zool. Jahrb. Syst. XXX, 1911, p. 504.

Vomerine teeth in oblique series originating in the middle between the choanae or a little further back and extending beyond the level of their posterior borders.

Head slightly broader than long; snout rather pointed, a little longer than the eye; canthus rostralis obtuse; loreal region oblique; nostril a little nearer the eye than the tip of the snout; interorbital space narrower than the upper eyelid; tympanum very distinct, a little more than half the diameter of the eye and narrowly separated from the latter.

Fingers rather short, obtuse, first longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{4}$ times as long as broad, $\frac{1}{2}$ length of head and body, a little shorter than the fore limb or than the foot. Toes obtuse, entirely and very broadly webbed, the web feebly emarginate; outer metatarsals separated nearly to the base; subarticular tubercles oval, moderately prominent; a tarsal fold; inner metatarsal tubercle oval, $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin of upper parts corrugated, back with numerous, very prominent, short oval warts disposed irregularly, sides with larger warts; smaller, subconical warts on the limbs; sometimes a fold across the head, behind the eyes; a rather prominent curved glandular fold above and behind the tympanum.

Grey above, uniform on the back, somewhat marbled with black and yellow on the sides; hinder side of thighs vermiculate with black and white. Lower parts white, with small grey spots on the throat.

Males with external vocal sacs, forming folds on the sides of the throat, which are blackish.

Measurements of male type specimen.

From snout to vent	...	...	...	54 millim.
Head	...	...	...	19
Width of head	...	...	...	20
Snout	...	...	...	8.5
Eye	...	...	...	7
Interorbital width	...	...	...	3.5
Tympanum	...	...	...	4
Fore limb	...	...	...	30
Hind limb	...	...	...	83
Tibia	...	...	...	26
Foot	...	...	...	29

Habitat. Wetter Island, Sunda Archipelago.

I have not seen examples of this frog, but am indebted to Dr. Roux for notes which show that if *R. cancrivora* is to be regarded as a valid species, *R. verruculosa* also deserves to be treated as such.

4. *Rana tigrina*.

- Rana tigrina*, Daud., *Hist. Rain. Gren. Crap.* p. 64, pl. xx (1803), and *Hist. Rept.* VIII, p. 125 (1803); Kelaart, *Prodr. Faun. Zeyl.* p. 192 (1852); Günth., *Proc. Zool. Soc.* 1875, p. 567; Anders., *Anat. Zool. Res. Yunnan*, p. 837 (1879); Bouleng., *Faun. Ind., Rept.* p. 449, fig. (1890); S. Flower, *Proc. Zool. Soc.* 1896, p. 901, and 1899, p. 891, pl. lix, fig. 2; Stejneger, *Herp. Japan*, p. 139, fig. (1907); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 122, figs., pl. v, figs. 1-2, and pl. vi, fig. 1; Bouleng., *Rec. Ind. Mus.* XV, 1918, pp. 51, 65; Annand., *Rec. Ind. Mus.* XV, 1918, p. 60, fig.
- ? *Rana picta*, Gravenh., *Delic. Mus. Zool. Vratisl.* I, p. 39 (1829).
- Rana brama*, Lesson, in Bélanger, *Voy. Ind. Or., Rept.* p. 329, pl. vi (1834).
- Rana tigrina*, part., Dum. et Bibr., *Érp. Gén.* VIII, p. 375 (1841); Günth., *Cat. Batr. Sal.* p. 9 (1858); Peters, *Mon. Berl. Ac.* 1863, p. 77; Günth., *Rept. Brit. Ind.*, p. 407 (1864); Steind., *Novara, Amph.* p. 17 (1867); Bouleng., *Cat. Batr. Ecaud.* p. 26 (1882), and *Faun. Mal. Pen., Rept.* p. 234, fig. (1912).
- Rana malabarica* (non D. et B.), Kelaart, *op. cit.*, p. 191.
- Rana crassa*, Jerdon, *Fourn. As. Soc. Beng.* XXII, 1853, p. 531; Anders., *Proc. Zool. Soc.* 1871, p. 199; Annand., *Rec. Ind. Mus.* XV, 1918, p. 61, fig.
- Rana occipitalis*, Günth., *Cat. Batr. Sal.* p. 130, pl. xi (1858); Bocage, *Forn. Sc. Lisb.* I, 1866, p. 73; Boettg., *Abh. Senck. Ges.* XII, 1881, p. 416; Bouleng., *Cat. Batr. Ecaud.* p. 27 (1882); Bocage, *Herp. Angola*, p. 155 (1895); Werner, *Sitzb. Ak. Wien*, CXVI, i, 1908, p. 1887.
- Pyxicephalus fodiens*, Peters, *Mon. Berl. Ac.* 1860, p. 186.
- Rana hydraletis* (Boie), Peters, *Mon. Berl. Ac.* 1863, p. 78.
- Hoplobatrachus ceylanicus*, Peters, *Mon. Berl. Ac.* 1863, p. 449; Günth., *Rept. Brit. Ind.* p. 410 (1864).
- Rana bragantina*, Bocage, *Rev. Mag. Zool.* 1864, p. 253.
- Rana tigrina*, var. *pantherina* (Fitz.), Steind., *Novara, Amph.* pl. i, figs. 14-17 (1867).
- Rana* (*Hoplobatrachus*) *ceylanica*, Günth., *Ann and Mag. N.H.* (4) IX, 1872, p. 87.
- Rana tigrina*, var. *ceylanica*, Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 94.
- Rana burkilli*, Annand., *Rec. Ind. Mus.* V, 1910, p. 79.
- Rana rugulosa* (non Wiegman), Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 126, pl. v, fig. 3; Malcolm Smith, *Fourn. N.H. Soc. Siam*, II, 1917, p. 263, pl.—, fig. 2; Annand., *Rec. Ind. Mus.* XV, 1918, p. 60.
- Rana tigrina*, vars. *crassa*, *occipitalis*, *burkilli*, Bouleng., *Rec. Ind. Mus.* XV, 1918, p. 57.

Forma typica.

Vomerine teeth in strong or very strong, oblique, straight or slightly curved series narrowly separated from each other, originating close to the anterior border of the choanae and extending beyond the level of their posterior borders. A rather feeble bony process at the anterior extremity of the lower jaw in adult specimens.

Head as long as broad or broader than long, rather strongly depressed; snout rounded or pointed, projecting more or less beyond the mouth, longer than the eye; canthus rostralis obtuse; loreal region very oblique, more or less concave; nostril equidistant from the eye and the tip of the snout or nearer the latter; interorbital space much narrower than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to once the diameter of the eye, $1\frac{1}{2}$ to $2\frac{1}{2}$ times its distance from the latter.

Fingers rather short or moderately long, obtusely pointed, with a more or less distinct dermal border, first longer than the second, third shorter than the snout; subarticular tubercles rather small and feebly prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels overlapping when the limbs are folded at right angles to the body; tibia $2\frac{1}{4}$ to 3 times as long as broad, $1\frac{3}{4}$ to $2\frac{1}{4}$ times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb or than the foot. Toes obtuse or somewhat swollen at the end, entirely webbed, the web but feebly emarginate; outer metatarsals separated nearly to the base; subarticular tubercles rather small; a dermal fold on the outer side of the fifth toe, and a feeble one on the inner side of the first and of the tarsus, interrupted by the inner metatarsal tubercle, which is blunt, feebly compressed, $1\frac{3}{4}$ to 3 times in the length of the inner toe and $7\frac{1}{2}$ to $12\frac{1}{2}$ times in that of the tibia; no outer metatarsal tubercle.

Skin of upper parts smooth or granulate, with large prominent warts and longitudinal glandular folds, these folds usually regular, though not extending along the whole length of the back, 6 to 14 in number; a strong glandular fold from the eye to the shoulder, and usually a fold across the head behind the eyes. Lower parts smooth.

Yellowish, green, or olive above, with dark spots, which may be disposed in longitudinal series on the back, or form two or three cross-bands; a narrow yellow vertebral streak often present; young with a yellowish lateral band, from behind the eye, which may entirely disappear in the adult; a dark canthal streak and a more or less distinct light streak above the upper lip, which may be blackish or spotted with blackish; limbs with dark cross-bands, which may be irregular or replaced by large spots; hinder side of thighs marbled black and yellow; often a fine yellow line along the upper surface of the thigh and another along the inner side of the calf. Lower parts white, without spots, or with only a few on the throat.

Male with a white external vocal sac on each side of the throat, forming longitudinal folds; fore limb moderately thickened; a strong pad on the inner side of the first finger, covered, during the breeding season, with a greyish-brown velvet-like horny layer.

Nasal bones large, in contact with each other and with the fronto-parietals; ethmoid hidden above or only a small portion uncovered; fronto-parietals narrow, feebly grooved along the median line, sometimes fused; zygomatic process of squamosal long. Omosternum forked at the base. Terminal phalanges obtusely pointed.

Tadpole with the tail attenuate to a fine point and about twice as long as the body. Circular lip entirely bordered with papillae; beak entirely black, the upper mandible with a strong median cusp, the lower with two; horny teeth in 3 or 4 upper and 4 or 5 lower series, the outer upper long and uninterrupted,

the outer lower short and uninterrupted, the outer but one lower long and uninterrupted.

Eggs small, 2 millim. in diameter in female measuring 162 millim. from snout to vent.

Measurements in millimetres.

	1. ♂	2. ♂	3. ♀	4. ♂	5. ♀	6. ♀	7. ♀	8. ♀	9. ♀	10. ♀	11. ♀	12. ♀	13. ♀	14. ♀
From snout to														
vent ..	108	77	86	108	120	142	153	162	70	65	88	80	158	114
Head ..	36	26	29	38	38	46	50	51	24	22	30	29	50	38
Width of head	43	26	29	40	41	55	60	62	25	23	32	20	61	40
Snout ..	16	10	12	17	16	20	19	21	9	9	11	12	21	16
Eye ..	10	8	9	11	11	12	13	15	8	8	10	9	14	10
Interorbital														
width ..	4	3	3	4	4	5	5	6	3	3	3	3	6	5
Tympanum ..	9	6	6	8	8	11	10	11	6	5	6	6	11	8
Fore limb ..	53	37	40	54	57	75	75	80	37	33	47	41	75	53
First finger ..	11	7	8	9	11	15	16	15	7	7	9	7	16	11
Second finger	9	6	6	7	9	12	12	11	5	5	7	6	12	9
Third finger ..	12	8	9	10	14	15	16	15	7	8	10	8	16	12
Fourth finger	9	5	6	6	7	12	11	11	5	5	7	6	11	9
Hind limb ..	167	117	130	156	170	202	210	222	100	97	125	116	225	174
Tibia ..	58	38	43	51	54	71	72	74	31	30	43	38	75	60
Foot ..	55	36	42	50	52	67	72	68	32	30	45	38	71	55
Third toe ..	27	17	20	27	27	33	36	33	15	15	22	17	34	27
Fourth toe ..	41	28	33	39	43	50	55	49	24	24	37	29	54	43
Fifth toe ..	27	18	23	27	28	35	41	35	17	17	25	19	35	28
First toe ..	13	9	10	12	13	17	16	17	7	7	9	8	17	14
Inner metatar-														
sal tubercle	7	3	4.5	5	6	9	6	9	4	4	5	4	9	6

1. Sikkim. 2—3. Nepal. 4—5. Lahore. 6. Benares. 7. Lingasugur, Deccan. 8. Madras. 9—10. Malabar. 11—12. Ceylon. 13—14. Penang (?).

Habitat. India from the Nepal Valley and the base of the Himalayas, Ceylon, Assam, Burma, and Southern Yunnan.

The locality 'Penang,' attached to specimens from Cantor's collection in the British Museum, is very doubtful, as in the case of other specimens, probably from India, described by Cantor as found in the Malay Peninsula.

[The geographical range of *R. tigrina* extends as far north and west as Peshawar, and I believe the base of the Baluchistan hills. The few specimens I have seen from the extreme north-west of India are, however, much duller in colour than those from Bengal and seem to be in other respects intermediate between the *forma typica* and *R. crassa*. Specimens from the Nepal Valley, beyond the outer foot-hills of the Himalayas, are typical. N. A.]

This species has a much wider distribution, extending to Siam, China, and Tropical Africa, but the specimens from these outlying countries deserve to be distinguished as races, which are even regarded by some as valid species. The four forms which I recognize, one of which, *R. occipitalis*, Gthr., is African, may be distinguished as follows:—

A. Regular longitudinal glandular folds, 6 to 14 in number, usually present on the back.

Tibio-tarsal articulation reaching eye or between eye and nostril; heels overlapping; tibia $1\frac{1}{2}$ to $2\frac{1}{2}$ times in length of head and body; metatarsal tubercle $\frac{1}{2}$ to $\frac{3}{4}$ length of inner toe.

Forma typica.

Tibio-tarsal articulation reaching tympanum or eye; heels not overlapping; tibia $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length of head and body; metatarsal tubercle $\frac{2}{3}$ to once length of inner toe .. var. *crassa*, Jerd.

B. Glandular folds much broken up or absent; if long, fewer in number; inner metatarsal tubercle $\frac{1}{2}$ to $\frac{3}{4}$ length of inner toe.

Tibio-tarsal articulation reaching eye or between eye and nostril var. *occipitalis*, Gthr.

Tibio-tarsal articulation reaching shoulder, tympanum, or posterior border of eye var. *pantherina*, Fitz.

Var. *crassa*, Jerd.

(*R. fodiens*, Peters, *ceylunica*, Peters).

A stouter, often more toad-like form, with very large, shovel-shaped inner metatarsal tubercle, the length of which is 1 to $1\frac{1}{2}$ times in the length of the inner toe and 5 to 7 times in the length of the tibia. The tibio-tarsal articulation reaches the tympanum or the eye, the heels do not overlap, and the length of the tibia, which is always less than that of the fore limb, is $2\frac{1}{2}$ to $2\frac{3}{4}$ times in that of head and body.

The web between the toes may be more deeply notched than in the typical form.

The coloration is the same as in the typical form, but the yellow vertebral streak appears to be more frequently absent. Some specimens have large black spots on the gular region.

Annandale observes that the colour of living specimens from Madras is much duller than in the typical *R. tigrina*, a dull brown being substituted for the greens and yellows.

The differences which separate *R. crassa* from *R. tigrina* are closely paralleled by the typical *R. esculenta* and its var. *lessonae*, which are connected by a complete gradation, and I feel sure that if a large number of specimens of *R. tigrina* could be obtained, from Ceylon for instance, exactly the same difficulties would arise in defining the var. *crassa*. Annandale, who believes *R. crassa* to be entitled to specific rank, mentions that "the behaviour of the living specimens sent to me from Madras differed totally from that of individuals of *R. tigrina*, s.s. The former when placed in a vivarium the bottom of which was covered with sand, burrowed immediately and concealed themselves below the surface. This I have never known *R. tigrina* to do. Moreover, they did not possess anything like the same power of leaping."¹ I have since pointed out² that similar fossorial habits have been observed in

¹ *Rec. Ind. Mus.* XV, 1918, p. 63.

² *Ann. and Mag. N.H.* (9) II, 1918, p. 255.

the vars. *lessonae* and *chinensis* of *R. esculenta*, and that this fact should be borne in mind by those who appeal to such ethological departures from the normal as an argument in favour of specific distinction.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.
	♀	♂	♀	♂	♂	♀	♀
From snout to vent ..	82	90	89	76	76	112	102
Head ..	28	31	29	23	26	36	33
Width of head ..	30	36	32	26	27	40	39
Snout ..	10	12	11	9	10	14	15
Eye ..	8	11	9	9	9	11	11
Interorbital width ..	4	3	3	2.5	2	4	4
Tympanum ..	6	6	6	5	5	8	8
Fore limb ..	39	49	42	36	39	57	60
First finger ..	8	9	8	7	7	10	11
Second finger ..	6.5	7	6	5	5	8	8
Third finger ..	9	10	9	7	8	11	11
Fourth finger ..	6.5	7	6	5	5	8	8
Hind limb ..	100	139	118	98	106	155	161
Tibia ..	35	42	35	31	52	48	48
Foot ..	38	44	41	32	32	50	50
Third toe ..	15	23	21	13	16	27	27
Fourth toe ..	25	34	31	24	25	38	40
Fifth toe ..	17	26	23	16	17	29	29
First toe ..	7	9	7	6	7	9	10
Inner metatarsal tu- bercle ..	..	7	6	6	5	7	7

1. Benares. 2—3. Madras. 4. Malabar. 5—7. Ceylon.

Habitat. This variety is on record from the United Provinces (Benares, Agra), Orissa (Chandbally), Madras town, Malabar and Ceylon.

Var. *pantherina*, Fitz.

(*R. burkilli*, Annand.; *R. rugulosa*, Annand. nec Wiegman.).

Differs from the typical form in the generally shorter hind limb, the tibio-tarsal articulation reaching the shoulder, the tympanum, or the posterior border of the eye, the heels not or but slightly overlapping, and the length of the tibia, which is less than that of the fore limb, being contained $2\frac{1}{2}$ to $2\frac{1}{2}$ times in that of head and body. The inner metatarsal tubercle is blunt, and its length is $2\frac{1}{2}$ to 4 times in that of the inner toe, $8\frac{3}{4}$ to 14 times in that of the tibia.

Although usually more rounded than in the typical form, the shape of the snout cannot be used for the distinction of this variety since it is more pointed and prominent in some specimens from China (Shanghai) than in others from India (Madras).

The folds on the back, if present, are short, and in many cases they are more correctly described as elongate warts.

The absence of any trace of a light streak above the upper lip, which is marked with vertical dark bars, one or two of which may extend to the eye, also distinguishes this form; the light lateral band and the vertebral streak are absent in all the specimens examined by me. The lower parts are often spotted or

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
From snout to vent	♀	♂	♀	♂	♂	♂	♀	♀	♂	♂	♀	♂	♀	♀	♀	♀	♀
Head	142	60	57	127	93	120	130	133	90	85	95	90	117	92	91	90	89
Width of head	47	20	19	39	30	40	41	44	32	28	32	28	37	28	28	29	29
Snout	53	21	21	44	32	44	45	53	34	32	34	30	43	32	31	33	31
Eye	20	9	8	16	12	16	16	16	11	12	12	12	15	11	12	12	11
Interorbital width	13	7	6	11	10	11	12	12	9	8	8	8	10	9	9	9	9
Tympanum	5	2.5	2.5	4	3	4	5	5	3	4	4	4	5	3	3	3	3
Fore limb	10	4	4	9	6	8	8	9	7	7	7	8	8	7	7	7	7
First finger	73	29	27	65	48	59	63	70	48	45	49	50	58	48	45	46	46
Second finger	15	6	6	13	9	12	12	13	10	10	9	11	12	9	9	9	8
Third finger	13	5	5	10	8	10	10	10	8	8	8	9	10	7	7	8	8
Fourth finger	15	7	6	14	10	14	14	14	11	10	10	11	13	10	10	10	10
Hind limb	12	4	4	10	7	10	9	10	7	7	8	9	9	7	7	7	7
Tibia	180	80	72	159	128	165	178	192	129	120	140	138	160	116	123	125	125
Foot	58	26	24	52	40	52	57	62	38	38	39	40	47	38	37	39	38
Third toe	62	26	24	54	44	59	59	64	44	42	43	47	54	42	43	42	42
Fourth toe	31	15	13	27	22	32	28	35	23	23	25	26	28	21	22	23	23
Fifth toe	60	21	18	42	35	51	46	54	38	34	35	39	43	32	34	34	34
First toe	35	16	13	30	26	36	33	38	27	24	26	28	30	23	24	24	25
Inner metatarsal tubercle	17	7	6	14	11	15	15	16	12	12	12	13	14	11	11	10	11
	6	3	2	6	3	5	4	6	4	3	3	4	5	4	3	4	4

1. Toungoo. 2. Thayetmyo. 3. Mandalay. 4. Pegu. 5. Takhana, Siam. 6. Tachin, C. Siam. 7-8. Siam. 9. Hué. 10-11. Ningpo.
12-13. Shanghai. 14-17. Formosa.

marbled with blackish, but a specimen from Pegu is without any spots, and others from Siam and Shanghai have the markings reduced to a streak in the middle of the throat.

This form is hardly to be distinguished from the African var. *occipitalis*, Gthr., the range of which extends from the Egyptian Soudan and Uganda to the Senegal and other parts of West Africa as far south as Angola. I am not sure I could always tell a Burmese or Siamese frog from an African, and the tadpoles are identical.

Habitat. Burma, Siam, French Indo-China, China, and Formosa. Annandale also records this frog from Koh Samuie Id., N.E. coast of Malay Peninsula, and reports having received a single specimen from Madras town, among several of the var. *crassa*.

The name *pantherina*, Fitz., based on specimens from Hong Kong, is the earliest that can be assigned to this variety. The type of *R. burkilli*, Annand. is from Tavoy, Tenasserim.

5. *Rana cancrivora*.

Rana cancrivora, Gravenh., *Delic. Mus. Zool. Vratisl.* I, p. 41 (1829); Tschudi, *Class. Batr.*, p. 39 (1838); Annand., *Mem. As. Soc. Beng.*, VI, 1917, p. 128, pl. v, fig. 4; Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1917, p. 264; Bouleng., *Rec. Ind. Mus.* XV, 1918, pp. 55, 65; Annand., *Rec. Ind. Mus.* XV, 1918, p. 63 fig.

Rana vittigera, Wieg., *N. Act. Ac. Leop. Carol.* XVII, 1835, p. 255, pl. xxi, fig. 1.

Rana rugulosa, Wieg., *t.c.* p. 258, pl. xxi, fig. 2.

Rana tigrina, part., Dum. et Bibr., *Erp. Gén.* VIII, p. 3751 (1841); Günth., *Cat. Batr. Sal.* p. 9 (1858); Peters, *Mon. Berl. Ac.* 1863, p. 77; Günth., *Rept. Brit. Ind.*, p. 407 (1864); Steind., *Novara. Amph.* p. 17 (1867); Bouleng., *Cat. Batr. Ecaud.* p. 26 (1882); van Kampen, *Nat. Tijdschr. Nederl. Ind.* LXIX, 1909, p. 33; Bouleng., *Faun. Mal. Pen.*, *Rept.* p. 234 (1912).

? *Rana gracilis*, var. *pulla*, Stoliczka, *Journ. As. Soc. Beng.* (2) XXXIX, 1870, p. 142.

Rana schlüteri, Werner, *Zool. Ans.* 1893, p. 84, *Verh. zool-bot. Ges. Wien*, XLIII, 1893, p. 357, and *Zool. Ans.* 1897, p. 266; Stejneger, *Herp. Japan*, p. 142 (1907).

Rana tigrina, var. *angustopal mata*, van Kampen, in M. Webb., *Zool. Ergebn.* IV, p. 388, pl. xvi, fig. 3 (1907).

Rana tigrina, var. *schlueteri*, Barbour, *Mem. Mus. Comp. Zool.* XLIV, 1912, p. 64.

Rana tigrina, var. *cancrivora*, Bouleng., *Rec. Ind. Mus.* XV, 1918, p. 58.

This frog has usually been confounded with *R. tigrina*, and I should have regarded it as a variety but for the fact, which is now well established, that the tadpole is very different and very similar to that of *R. limnocharis*, as first pointed out by van Kampen.

The vomerine teeth, which vary very considerably, often differ from those of *R. tigrina* in being disposed in rather short oblique series, well separated from the anterior borders of the choanae; but some specimens¹ have longer and stronger series, which may touch the inner anterior borders of the choanae.

¹ From Borneo, Java and Celebes.

The shape of the head varies greatly; it is often quite as long as broad, and it may even be slightly longer¹; the snout may be broadly rounded or as pointed as in any specimen of the typical *R. tigrina*. The diameter of the tympanum is $\frac{1}{2}$ to $\frac{7}{8}$ that of the eye and $1\frac{1}{2}$ to 2 times its distance from the latter.

The tibio-tarsal articulation reaches the eye or between the eye and the nostril, exceptionally only as far as the tympanum²; the heels strongly overlap; the length of the tibia is $2\frac{1}{2}$ to 3 times its width and is contained $1\frac{3}{4}$ to $2\frac{1}{4}$ times in the length from snout to vent. The web between the toes is strongly notched and does not reach the tip of the fourth; in some specimens even the two last phalanges of the fourth toe are free, and such may be described as having the foot $\frac{3}{4}$ webbed. The inner metatarsal tubercle is blunt and its length is contained $2\frac{1}{2}$ to 3 times in that of the inner toe; no outer tubercle.

Longitudinal dermal folds, in the strict sense, are often absent on the body; if present, they are reduced to 2 or 3 pairs, the longest of which start from behind the upper eyelid at some distance from the supratemporal fold; a V-shaped glandular fold often present in the middle of the back, between the shoulders.

The coloration is much as in *R. tigrina*, var. *pantherina*, but there may be, rather exceptionally,³ a light streak along the side of the body, as in the typical *R. tigrina*; a light vertebral line or broad band is sometimes present, but it is very rarely accompanied by a light line along the calf.⁴ Lower parts white, rarely spotted or marbled with blackish; the male's gular sacs grey or blackish.

The tadpole is very different from that of *R. tigrina* and hardly to be distinguished from that of *R. limnocharis*. The beak is devoid of the strong cusps and is white edged with black, and the horny teeth are in 2 upper and 3 lower series, all except the inner upper long and uninterrupted; the marginal papillae are present only on the sides of the upper lip. The tail is rather obtusely pointed, and not twice as long as the body.

The eggs measure 1 to $1\frac{1}{2}$ millim. in diameter.

Habitat. Malay Peninsula and Archipelago. The types of *R. vittigera* and *R. rugulosa* are from the Philippines and China (Macao, Cape Syngmore).

[*Rana cancrivora* is by far the commonest frog in rice-fields and ditches round the Inland Sea of Singgora in Peninsular Siam and also in the Malay State of Patani. It appears, however, to be rare (if it exists) in the southern districts of the Malay Peninsula.

Individuals are frequently found in brackish water, and I have seen one jump into the sea from a rock and swim ashore apparently without suffering. N. A.].

Completely linked with *R. tigrina* through the var. *pantherina*, it is highly remarkable for this species to be characterized by so

¹ In a male from Padas, Borneo.

² In a female from Chumpon, Siam.

³ Specimens from the Philippines and Celebes.

⁴ Specimens from the Philippines.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.
From snout to vent	♂	♀	♂	♀	♂	♂	♂	♀	♀	♀	♂	♀	♂	♂	♂	♀	♂	♂	♂	♀	♂	♂	♀	♀	♀	♀	♀	♀	♀	♀	♂
Head ..	57	77	49	82	60	88	77	88	75	65	56	67	59	57	57	73	86	81	78	86	59	54	57	57	66	61	75	72	72	82	68
Width of head	20	25	16	27	21	28	26	29	26	22	20	21	23	29	27	27	27	27	27	29	20	19	18	19	22	21	26	24	22	24	25
Snout ..	20	28	18	30	21	32	27	30	27	22	20	22	22	21	22	27	31	27	27	29	19	21	18	20	23	21	27	26	25	25	25
Eye ..	7	10	7	11	8	44	11	12	11	9	7	8	7	7	7	9	11	11	11	12	8	7	8	8	9	8	10	10	9	10	10
Interorbital width	2.5	2.5	2	3.5	3	4	3	3	3	3	2.5	3	2.5	2	2	3	3	3	3	3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	2.5	3
Tympanum	4	5	3.5	6	4	6	6	6	6	4	4	4	4	4	4	4.5	6	6	7	6	4	4	4	4	4.5	5	5	6	5	6	5
Fore limb	34	42	30	46	36	47	40	47	42	32	31	35	32	33	34	39	47	45	43	47	36	34	34	34	37	32	42	39	36	45	41
First finger	6	9	6	9	7	9	10	11	10	7	6	7	7	7	7	7	8	9	10	10	7	6	7	7	7	9	8	9	8	10	9
Second finger	5.5	7	5	8	6	8	7	8	8	6	5	6	6	6	5	7	6	8	7	7	5	5	5	5	5	7	7	7	8	7	7
Third finger	7	10	7	10	8	10	10	11	10	7	6.5	7	7	7	7	9	9	10	10	10	7	7	7	7	8	8	9	9	9	11	9
Fourth finger	5.5	6	4	6	5.5	7	6	8	7	5	5	6	6	5	5	6	6	8	7	7	5	5	5	5	5	6	6	7	6	8	7
Hind limb	81	102	74	119	86	131	115	132	112	93	82	102	87	95	92	108	127	120	121	140	90	87	88	93	111	95	107	103	105	122	110
Tibia ..	25	33	23	38	27	42	37	42	36	29	26	33	29	30	30	35	41	39	38	43	28	27	28	29	36	31	34	32	35	37	35
Foot ..	29	36	25	41	32	45	40	45	39	29	26	35	30	31	31	36	43	43	43	47	30	29	30	33	36	31	36	35	35	41	38
Third toe	15	18	14	20	17	22	19	23	20	14	13	17	14	15	15	18	21	20	20	23	15	14	15	18	19	17	18	17	17	20	20
Fourth toe	24	30	19	33	25	37	32	37	31	23	19	27	24	24	25	26	36	36	35	38	22	22	23	25	29	26	30	29	29	33	33
Fifth toe	17	21	14	23	18	27	22	27	21	16	14	19	17	16	17	18	24	24	25	25	16	16	16	18	21	18	23	22	20	25	23
First toe	6.5	9	6	10	8	11	9	11	10	7	6	8	7	7	7	9	9	11	10	12	7	7	7	7	8	9	7	9	8	10	10
Inner metatarsal tubercle.	3	4	2	4	3	4	4	4	4	3	2.5	3	2.5	3	2.5	3	4	4	4	4	2.5	3	3	3	3.5	3	4	3.5	3	4	4

1—2. Chumpon, Peninsular Siam. 3. Jambu, Jator. 4. Kedah 5. Deli, Sumatra. 6—9. Java. 10. Sumbawa. 11—13. Sumba. 14—15. Ombay. 16. Timor 17—20. Borneo. 21—24. Padas, N. Borneo. 25—26. Philippines. 27—28. Surigao, Philippines. 29. Laguna del Bay, Philippines. 30. Manado, Celebes. 31. Kema, Celebes.

different a tadpole. According to the principles that have guided me in the classification, *R. cancrivora* should be regarded as derived from *R. tigrina* and as leading to *R. limnocharis*, with which it agrees in the larval condition, more of the normal type prevailing in the genus *Rana*.

I conclude that the differentiation of the tadpole in the two species has arisen independently from that of the adult, and cannot therefore accept the suggestion made by Annandale that the case in question points to forms originally distinct having converged to resemble each other in the adult condition. My opinion is supported by various examples grouped by Giard under the term poecilogony.¹

6. *Rana verrucosa*.

Rana verrucosa, Günth., *Proc. Zool. Soc.* 1875, p. 567; Bouleng., *Cat. Batr. Ecaud.*, p. 29, pl. iv, fig. 1 (1882), and *Faun. Ind., Rept.*, p. 448 (1890); Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 94; Annand., *Rec. Ind. Mus.* XV, 1918, p. 17, pl. i, fig. 1.

Vomerine teeth in strong oblique series, touching the anterior borders of the choanae or narrowly separated from them.

Head a little broader than long, moderately depressed; snout obtusely pointed, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region very oblique, concave; nostril equidistant from the eye and the tip of the snout or a little nearer the latter; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{2}{3}$ the diameter of eye and about twice its distance from the latter.

Fingers obtusely pointed, first longer than the second, third as long as the snout or a little longer or a little shorter; subarticular tubercles large and very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ to 4 times as long as broad, $1\frac{3}{4}$ to $1\frac{5}{6}$ times in length from snout to vent, as long as or slightly shorter than the foot or the fore limb. Toes obtusely pointed or slightly swollen at the end, $\frac{2}{3}$ to $\frac{3}{4}$ webbed, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small but very prominent; tarsal fold reduced to the distal half; inner metatarsal tubercle elliptical, rather compressed, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the inner toe; a small outer metatarsal tubercle.

Head and back rough with warts of unequal size, some of which may form curved folds on the anterior half of the back; sometimes a rather indistinct fold across the head, behind the eyes; a strong, curved glandular fold from the eye to the shoulder. Lower parts smooth, granulate under the thighs near the vent.

¹ Cf. Boulenger, *Rec. Ind. Mus.* XV, 1918, p. 65, and *C.R. Ac. Sc. Paris*, CLXVII, 1918, p. 60.

Grey or brown above, with darker spots and large markings of which the most frequent and regular are a V-shaped band between the eyes, a >--<-shaped marking between the shoulders, and one or two cross-bars on the posterior part of the body; a broad light vertebral stripe is sometimes present, but, unlike what is the rule in *R. limnocharis* and most other species, it is usually interrupted by the dark markings; lips with dark vertical bars, two of which usually proceed from the eye; limbs with complete or interrupted dark cross-bars; sides of thighs black spotted with yellow, or marbled black and yellow. Lower parts white, throat often spotted or mottled with brown.

Male with internal vocal sacs and a rather feebly developed pad on the inner side of the first finger.

Osteological characters as in *R. limnocharis*.

Tadpole with the tail obtusely pointed, about $1\frac{1}{3}$ times as long as the body. Beak white, broadly edged with black; a long marginal series of upper labial teeth with a short series on each side; 3 long uninterrupted series of lower labial teeth, outer shortest; lower lip with a series of papillae.

Measurement in millimetres.

	1. ♂	2. ♀	3. ♀	4. ♀	5. ♀	6. ♀	7. ♀	8. ♀	9. ♀
From snout to vent ..	39	59	53	50	43	43	40	48	33
Head ..	15	20	19	18	16	16	15	17	12
Width of head ..	16	22	20	20	17	18	16	18	13
Snout ..	5	7	6.5	6.5	6	6	5	6.5	4.5
Eye ..	5	7	6.5	6.5	6	6	5	6	4.5
Interorbital width ..	2.5	3.5	3	3	2.5	2.5	2.5	3	2
Tympanum ..	3	4.5	4	4	3.5	3.5	3	4	3
Fore limb..	23	35	30	29	25	25	23	27	20
First finger ..	4.5	7	6	6	5	5	5	6	4
Second finger ..	3.5	6	5	5	4	4	4	5	3
Third finger ..	4.5	8	6.5	7	6	6	5.5	6	4
Fourth finger ..	3.5	5	5	5	4	4	4	4	3
Hind limb ..	66	103	88	90	75	80	70	83	57
Tibia ..	22	33	28	28	23	25	23	27	19
Foot ..	22	33	28	28	25	25	23	27	19
Third toe ..	12	17	15	16	14	13	12	15	10
Fourth toe ..	18	28	23	23	20	20	18	23	16
Fifth toe..	12	19	16	16	14	13	12	15	10

1—7. Malabar (types). 8. Man Kodnur, Travancore. 9. Koni, Travancore.

Habitat. Malabar hills, up to 7000 feet in the Nilgiris, 4000 feet in Travancore.

[This frog is very abundant in the Travancore hills. It is less common in the Nilgiris, but by no means scarce in the artificial lake at Ootacamund.

Unlike *R. limnocharis* var. *nilagirica*, *R. verrucosa* avoid small springs and pools and is usually found at the edge of streams or large reservoirs. Though the two frogs occur in the Nilgiris in practically the same localities I have never seen them together. N. A.].

7. *Rana limnocharis*.

- Rana limnocharis* (Boie), Wiegman, *N. Acta Ac. Leop.-Carol.* XVII, i, 1835, p. 255; Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 102, and *Fourn. As. Soc. Beng.* XLII, 1873, p. 116; S. Flower, *Proc. Zool. Soc.* 1899, p. 893; Boulenger, *Spol. Zeyl.* II, 1904, p. 73; Van Kampen, *Zool. Jahrb., Syst.* XXII, 1905, p. 703; Stejneger, *Herp. Japan*, p. 127, figs. (1907); Van Kampen, *Nat. Tijdschr. Ned. Ind.* LXIX, 1909, p. 35; Boulenger, *Vert. Faun. Mal. Pen., Rept. Batr.* p. 236 (1912); Malcolm Smith, *Fourn. N. H. Soc. Siam*, II, 1916, p. 165; Annandale, *Mem. As. Soc. Beng.* VI, 1917, p. 133, figs., pl. v. fig. 6; Annandale and Rao, *Rec. Ind. Mus.* XV, 1918, p. 33.
- Rana gracilis* (non Gravenhorst), Wiegman, *l.c.*; Peters, *Mon. Berl. Ac.* 1863, p. 78; Andersson, *Proc. Zool. Soc.* 1871, p. 200; Günther, *Proc. Zool. Soc.* 1875, p. 567; Andersson, *Anat. Zool. Res. Yunnan*, p. 840 (1879).
- Rana nilagirica*, Jerdon, *Fourn. As. Soc. Beng.* XXI, 1853, p. 531; Boulenger, *Spol. Zeyl.* II, 1904, p. 73.
- Rana agricola*, Jerdon, *l.c.*
- Rana vittigera*, part., Günther, *Cat. Batr. Sal.* p. 9 (1858).
- Rana gracilis*, part., Günther, *Rept. Brit. Ind.* p. 1409 (1864); Stoliczka, *Fourn. As. Soc. Beng.* XXXIX, 1870, p. 142; Boulenger, *Cat. Batr. Ecaud.* p. 28 (1882).
- Rana gracilis*, var. *andamanensis*, part., Stoliczka, *t. c.* p. 143.
- Rana limnocharis*, part., Boulenger, *Faun. Ind., Rept.* p. 450 (1890).
- Rana tigrina* (non Daud.), Annandale, *Rec. Ind. Mus.* VIII, 1912, p. 8.
- Rana wasi*, Annandale, *Mem. As. Soc. Beng.* VI, 1917, p. 131, pl. v, fig. 5.
- Rana limnocharis*, subsp. *andamanensis*, Annandale, *t. c.* p. 133, pl. v, fig. 7.
- Rana limnocharis*, subsp. *nilagirica*, Annandale, *t. c.* p. 134.
- Rana limnocharis*, subsp. *syhadrensis*, Annandale, *Rec. Ind. Mus.* XVI, 1919, p. 123.

Forma typica.

Vomerine teeth in more or less oblique series between the choanae or extending a little beyond the level of their posterior borders, usually short and more widely separated from the anterior corners of the latter than from each other, but exceptionally¹ nearly touching the choanae in front; sometimes² almost entirely behind the level of the choanae.

Head as long as broad, exceptionally slightly longer or slightly broader, moderately depressed; snout rounded or pointed,³ projecting more or less beyond the mouth, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region oblique, more or less concave; nostril usually nearer the end of the snout than the eye; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye and 2 to 3 times its distance from the latter.

¹ Perak, Malacca; Borneo, the other extreme in a female from Ningpo, in which the teeth form two small oval groups close together and widely separated from the choanae. Stejneger did not seem to be aware of the great amount of variation in the vomerine teeth when he adduced the character of their more posterior position for placing *R. limnocharis* far away from *R. tigrina* in the system.

² Several specimens from the Nilgiris. Stejneger describes these groups of teeth in Japanese specimens as having the anterior extremities on a line with the posterior borders of the choanae.

³ An acutely pointed snout, as figured by Annandale, is exceptional; the usual form is as in his figure of *R. wasi*.

Fingers obtusely pointed, first longer than the second, third as long as the snout or a little shorter or a little longer; subarticular tubercles well developed and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the tympanum, the eye, or the nostril, the heels more or less overlapping¹ when the limbs are folded at right angles to the body; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $2\frac{1}{2}$ times in length from snout to vent, as long as or a little longer than the foot, rarely a little shorter, usually a little shorter than the fore limb. Toes obtusely pointed or slightly swollen at the end, usually $\frac{1}{2}$ webbed, three phalanges of fourth free, rarely $\frac{2}{3}$ webbed,² only two phalanges of fourth free; outer metatarsals united in the basal half or third; subarticular tubercles rather small but very prominent; tarsal fold absent or reduced to the distal half; inner metatarsal tubercle oval or elliptical, blunt, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; a small outer metatarsal tubercle exceptionally very indistinct,³ or confluent with the dermal fold of the outer toe.

Upper parts with more or less prominent warts, with or without longitudinal glandular folds on the back, which are usually short or much interrupted; a more or less distinct fold across the head, behind the eyes, and a strong, curved, glandular fold from the eye to above the shoulder. Lower parts smooth, or posterior part of belly and proximal part of thighs granulate.

Grey, brown, or olive above, sometimes suffused with bright carmine,⁴ usually with more or less distinct dark markings, of which the following are the most characteristic, although by no means constant:—A **V**-shaped band from eye to eye; a **>—<**-shaped marking on the back between the fore limbs, the fork on each side embracing a light spot, which is sometimes continued as a band along the body;⁵ this dark marking sometimes **W**-shaped or broken up into five spots; a straight or **V**-shaped band across the sacral region. A yellowish vertebral line or broad band often present, dividing the above markings. Lips with dark vertical bars, two of which usually proceed from the eye; limbs with complete or, more often, incomplete dark cross-bars; rarely a light line along the calf; sides of thighs yellow, marbled with black. Lower parts white, throat rarely mottled with brown.⁶

Male with a vocal sac on each side, forming loose folds on the throat, which is brown or blackish on the sides, more frequently with a large **M**-shaped black marking; fore limbs robust; a rather strong pad on the inner side of the first finger.

¹ Describing a female specimen from Japan, Stejneger says the heels only touch, without overlapping. I have never seen such a specimen; in the one with the shortest limbs (Shanghai) the heels slightly overlap. Stejneger however contradicts himself on this point, as in the key to the species of *Rana* (p. 94) he assigns to *R. limnocharis* "heels overlapping considerably."

² Several specimens from Malabar.

³ A few specimens from Malabar, Sikkim, and Borneo.

⁴ Cf. Boulenger, *P.Z.S.* 1890, p. 31.

⁵ This light band is a remnant of that which is often better developed in *R. tigrina* and *R. cancrivora*.

⁶ Specimens from the Nilgiris.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.
From snout to vent	♂	♂	♂	♀	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♀	♂	♀	♀	♀	♀
Head ..	40	49	48	50	37	43	39	46	42	35	39	39	46	40	45	40	54	40	39	39	34	41	43	64	51	45	39
Width of head	14	17	17	18	13	16	13	15	15	14	13	14	16	14	16	14	18	13	14	14	13	14	15	20	17	15	13
Width of head	14	17	17	18	13	16	13	15	15	14	13	14	16	14	16	14	18	13	14	14	13	14	15	20	18	15	12
Snout	5	6	6	7	5	5	4	5	5	5	5	5	6	5	6	5	7	5	5	5	5	5	5	7	6	5	4
Eye ..	5	6	6	5	5	5	4	5	5	4	5	5	5	5	6	5	7	5	5	5	5	5	5	7	6	5	4
Interorbital width	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2
Tympanum	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	3	3	2
Fore limb	19	29	26	27	18	20	19	23	21	19	20	21	23	21	26	22	28	21	20	22	18	20	24	30	29	26	20
First finger	5	6	5	5	4	4	4	5	5	4	5	5	5	5	6	5	6	5	5	5	5	5	5	5	5	5	5
Second finger	5	6	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Third finger	5	6	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Fourth finger	5	6	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Hind limb	53	77	69	71	47	56	55	60	57	52	57	58	68	60	73	61	83	61	59	64	48	59	70	89	91	77	58
Tibia ..	17	24	21	22	15	17	16	18	17	17	18	18	21	19	23	19	27	19	19	19	15	19	21	28	27	24	19
Foot ..	20	25	23	24	17	21	19	21	17	19	19	19	23	21	23	20	28	19	19	21	15	20	24	28	30	27	19
Third toe	11	13	11	11	8	9	9	10	10	8	10	10	12	10	12	10	13	9	9	11	8	10	12	13	15	13	11
Fourth toe	15	20	17	17	13	15	14	16	15	13	15	15	18	17	18	16	21	15	15	17	11	15	18	21	25	20	16
Fifth toe	9	13	10	11	7	9	9	10	10	7	10	10	11	10	12	9	14	9	9	10	7	9	12	13	17	14	10

1. Hiogo, Japan. 2-3. Yoyoyama, Loo Choo Ids. 4. Loo Choo Ids. 5-7. Shanghai. 8-9. Ningpo. 10. Da Laen San, S. W. of Ningpo.
 11. Da Zeh Valley, Che Kiang. 12. Katang, Che Kiang. 13. Formosa. 14. Sze Chuen. 15-16. Hong Kong. 17. Hainan. 18-22. Man Son
 Mta., Tonkin. 23-26. Sikkin. 27. Nam Ting Pokhri, Darjiling.

	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.	44.	45.	46.	47.	48.	49.	50.	51.	52.	53.	54.	55.	
From snout to vent	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	♀	♀	♀	♂	♂	♀	♂	♀	♂	♂	♂	♀	
Head ..	..	43	64	51	45	47	46	44	33	37	36	35	52	36	35	51	50	64	62	63	45	44	51	42	50	46	42	36	6
Width of head	..	15	20	17	15	16	16	16	12	12	12	11	17	12	11	17	17	21	20	20	16	16	17	15	18	16	15	13	16
Snout ..	..	15	20	18	15	16	16	16	12	12	12	11	17	12	11	17	16	21	20	20	16	16	17	15	18	16	15	13	16
Eye ..	..	5	7	6	5	6	6	6	4	4	4	4	6	4	4	6	6	8	7	8	6	6	6	5	5	6	5	5	6
Interorbital width	..	5	7	6	5	6	6	6	4	4	4	4	6	4	4	6	6	7	7	7	6	6	6	5	5	6	5	5	6
Tympanum ..	..	2	3	2	2	2	2	2	2	1	5	1	5	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	5
Fore limb ..	..	3	4	3	5	3	3	3	2	5	2	5	2	3	2	5	4	4	4	4	3	5	4	3	5	3	3	3	3
First finger ..	..	24	30	29	26	24	23	17	20	19	20	28	20	18	28	26	32	30	32	26	23	27	22	26	26	22	21	23	23
Second finger ..	..	4	5	7	6	6	5	6	5	3	5	4	4	4	6	6	7	7	7	7	5	5	6	5	6	6	5	4	5
Third finger ..	..	3	5	5	4	4	5	4	3	3	3	3	5	3	3	5	4	5	5	5	4	4	4	3	5	4	3	5	5
Fourth finger ..	..	5	7	7	7	6	7	6	4	4	4	4	7	5	4	6	6	7	7	8	6	5	6	5	6	6	5	5	5
Hind limb ..	..	3	5	5	4	4	5	4	3	3	3	3	5	3	3	4	4	5	5	5	4	4	4	3	4	4	3	3	3
Tibia ..	..	70	89	91	77	75	77	75	53	53	53	55	78	59	52	75	71	95	85	91	70	68	70	61	73	77	65	58	67
Foot ..	..	21	28	27	24	23	23	23	16	16	15	16	24	19	16	24	23	32	28	30	22	22	23	19	24	26	21	18	22
Third toe ..	..	24	28	30	27	24	26	26	17	17	17	17	25	20	17	24	22	30	26	30	23	22	23	19	24	25	20	19	22
Fourth toe ..	..	12	13	15	13	14	14	9	9	9	9	9	13	10	9	10	11	14	12	14	11	11	9	12	11	10	9	10	16
Fifth toe ..	..	18	21	25	20	21	22	22	13	13	14	13	20	16	14	17	17	22	20	22	18	17	18	15	18	15	15	15	9
	..	12	13	17	14	14	15	9	9	9	9	9	13	10	9	9	10	13	12	14	11	11	9	10	11	10	9	9	9

Punduloya.

Trincomalee.

Madras Presidency.

Trivandrum.

Malabar.

Nilgiri.

Toungoo.

41. Punduloya.

40. Trincomalee.

39. Ceylon.

36-38. Madras Presidency.

35. Trivandrum.

32-34. Malabar.

42-46. Toungoo.

41. Punduloya.

40. Trincomalee.

39. Ceylon.

36-38. Madras Presidency.

35. Trivandrum.

32-34. Malabar.

42-46. Toungoo.

From snout to vent	56.	57.	58.	59.	60.	61.	62.	63.	64.	65.	66.	67.	68.	69.	70.	71.	72.	73.	74.	75.	76.	77.	78.	79.	80.	81.
Head ..	♂	♂	♂	♂	♀	♀	♀	♀	♀	♂	♀	♀	♂	♀	♂	♀	♂	♀	♀	♀	♀	♀	♀	♂	♀	♀
Width of head	..	15	14	16	13	17	16	21	20	19	14	20	19	15	19	14	15	16	17	15	20	20	19	19	15	17
Snout ..	..	15	14	16	13	17	16	21	20	19	14	20	19	15	19	14	15	16	17	15	20	20	19	19	15	17
Eye ..	..	6	5	6	5	7	6	8	8	7	5	8	7	5	7	5	5	6	6	5	5	8	8	8	5	5
Interorbital width	..	5	5	6	5	6	6	7	7	6	5	7	6	5	6	4	5	6	6	5	6	5	6	6	5	5
Tympanum..	..	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fore limb ..	..	3	3	3	3	3	3	5	4	4	3	4	4	5	3	4	2	5	3	3	3	4	4	3	5	4
First finger ..	..	24	21	25	21	25	24	32	32	30	21	32	29	23	31	20	21	26	27	25	33	33	31	31	20	27
Second finger	..	..	6	5	6	5	6	5	7	7	5	7	7	5	6	4	5	5	6	6	7	7	6	8	5	7
Third finger..	..	..	4	3	5	5	3	5	4	4	5	5	4	5	4	5	3	5	3	5	5	5	5	6	4	5
Fourth finger	..	..	6	5	7	5	6	5	7	7	5	8	7	5	7	5	5	5	6	6	7	7	6	8	5	7
Hind limb ..	..	..	3	5	3	4	3	4	4	3	5	4	4	3	5	4	3	5	3	5	4	4	5	5	3	5
Tibia ..	..	73	59	69	59	78	65	92	89	86	58	93	87	66	92	53	60	70	79	69	96	92	86	90	70	83
Foot ..	..	24	20	22	19	25	20	30	29	28	18	30	28	22	29	17	20	22	25	22	32	31	27	30	22	27
Third toe ..	..	..	24	20	24	20	26	20	30	29	19	30	28	22	31	18	20	22	26	23	32	30	27	31	22	27
Fourth toe ..	..	..	12	9	12	10	13	10	14	14	13	9	15	14	10	14	9	10	10	13	12	14	14	13	10	15
Fifth toe ..	..	..	18	16	18	16	20	16	22	22	21	15	24	22	17	24	14	16	16	20	17	24	23	22	25	17
	..	..	12	9	11	10	13	10	14	14	13	8	15	14	10	14	8	9	10	13	11	15	14	13	15	11

56. Kedah. 57. Kuala Lipis, Pahang. 58. Larut hills, Perak. 59-60. Perak. 61-64. Malacca. 65-67. Singapore. 68-69. Deli, Sumatra. 70-71. Java. 72-74. Lombok. 75-77. Borneo. 78. Kuching, Sarawak (type of *R. wasi*). 79-80. Great Natuna. 81. Luzon.

Nasal bones large, in contact with each other, narrowly separated from the frontoparietals, only a small portion of the ethmoid remaining uncovered; frontoparietals narrow, flat; zygomatic process of squamosal moderately long. Omosternum forked at the base. Terminal phalanges obtusely pointed.

Tadpole with the tail attenuate to a rather obtuse point, about twice as long as the body. Beak white, edged with black; a long marginal series of upper labial teeth with a short series on each side; 3 long uninterrupted series of lower labial teeth, outer shortest; lower lip with two series of long papillae.

[Individuals from comparatively high altitudes in the Himalayas, Burma and the Western Ghats are usually small and at some spots in the Himalayas (*e.g.* Sitong Ridge in the Darjiling District) are of a peculiar grey colour with rounded dorsal warts. No definite structural differences, however, can be found to separate most of these mountain forms, except that in the race peculiar to the Western Ghats in Bombay the first and second fingers are usually almost equal or subequal in length. For this Bomby race I have recently proposed the varietal name *syhadrensis* (see *Rec. Ind. Mus.* XVI, p. 123; 1919). The Nilgiri race (*nilagirica*, Jerdon) is not dwarfed.

Rana limnocharis is, after *R. cyanophlyctis*, the commonest and most universally distributed of the Indian frogs. It frequents the edge of ponds and marshes and leaps into the water when disturbed, as a rule rapidly swimming ashore again. It cannot skip on the surface as *R. cyanophlyctis* does. In mountainous districts it undergoes a prolonged period of hibernation, during which it conceals itself. Individuals which have fallen into wells and been unable to escape or have been placed there in order to eat insect larvae (as I believe is a custom in some parts of India) float on the surface in cold weather in a semi-torpid condition.—*N. A.*]

Habitat. Eastern Asia, from Japan and China to India, Ceylon and the Malay Peninsula and Archipelago, eastward to the Philippines, Borneo and Lombok. Recorded from up to 7000 ft. in Sikkim.

I have placed the recently described *R. wasi*, Annand., from N. Borneo, the Nicobars, Burma, the Khasi Hills, and the extreme east of the Himalayan foothills, simply in the synonymy of *R. limnocharis*, as the short description does not give a single character to justify a separation, and the figure agrees perfectly well with an average specimen of the typical form. Dr. Annandale has favoured me with the loan of one of the type specimens, from Kuching, Sarawak.

Var. *nilagirica*, Jerdon.

Differs from the typical form in the longer hind limbs, the tibio-tarsal articulation reaching the tip of the snout. As however the specimens referred to *R. nilagirica* resemble very closely others, likewise from the Nilguries, in which the limbs are not longer than in the typical form, and as Dr. Annandale has observed an

almost complete grading between the two, I am no longer in favour of reviving Jerdon's species.

The pale streak or spot between the eye and the commissure of the jaws, which Annandale points out as characteristic, is also to be seen in some of the other specimens from the Nilguries, as well as in a form from the Malay Peninsula.

[I have recently examined a very large series of specimens in the Nilguries. Individuals that conform more or less closely to the varietal type occur all over the plateau and also in the gorge of the Bhavani River at the base of the hills. With them are found individuals that could hardly be distinguished from the *forma typica*.

This frog lives at the edge of small springs and ditches and in patches of marshy ground on the hill-side. It breeds in stagnant water.—N. A.].

Measurements in millimetres.

			1.	2.	3.
			♀	♀	♀
From snout to vent	..	..	56	48	48
Head	..	..	2	18	17
Width of head	..	..	20	18	17
Snout	..	..	7	7	6
Eye	..	..	6	6	5
Interorbital width	..	..	2.5	2.5	2.5
Tympanum	..	..	4	3.5	3.5
Fore limb	..	..	31	27	27
First finger	..	..	7	6	6
Second finger	..	..	5	5	5
Third finger	..	..	7	7	7
Fourth finger	..	..	4	5	5
Hind limb	..	..	94	89	90
Tibia	..	..	30	28	28
Foot	..	..	30	30	30
Third toe	..	..	16	15	16
Fourth toe	..	..	24	23	24
Fifth toe	..	..	16	15	16

1. Nilguries. 2. Malabar. 3. Madras Presidency.

Habitat. Nilgiri and Shevaroy hills, Madras Presidency.

Var. syhadrensis, Annand.

Described as "a dwarfed race akin to the subsp. *nilagirica*, but of much smaller stature and with the hind limbs as a rule shorter. The first finger hardly extends beyond the second; the hind feet are as in the typical form except that the webbing is slightly less extensive and the tibio-tarsal articulation reaches the anterior border of the eye or a point between it and the tip of the snout. The dorsal surface is gray with black spots sometimes with a reddish suffusion; a narrow pale mid-dorsal line is often present; the ventral surface is white, with the whole of the throat black in the adult male."

Measurements in millimetres.

	1.	2.
From snout to vent	♂	♀
Head ..	27	31.5
Width of head ..	11	12.5
Snout ..	9.5	11
Eye ..	4.5	6
Interorbital width ..	3.4	3.4
Tympanum ..	2.8	3.
Fore limb ..	1.7	2
First finger ..	13.2	16
Second finger ..	4	5
Hind limb ..	3.8	4.5
	42.7	45.8

Habitat. Hills and elevated valleys of the middle region of the Bombay Presidency, between 2000 and 4000 feet altitude.

Since describing this form, Dr. Annandale has become acquainted with its tadpole, having received from Khandalla in the Western Ghats series which show the mouth disc to have normally only 3 rows of horny teeth (one upper and two lower). In two specimens examined, however, the rows are abnormal and asymmetrical. In one of those individuals five rows can be distinguished. Dr. Annandale thinks the tadpoles described by Ferguson (*Journ. Bomb. N.H. Soc.* XV, 1904, p. 501) from Travancore should be referred to this variety.

Var. andamanensis, Stoliczka.

Annandale has pointed out that this name is founded on examples of *R. doriae*, Blgr., and of a small form of *R. limnocharis* to which he proposes to restrict it.

"This form closely resembles the *forma typica* except in its small size and peculiar coloration. The dorsal surface of the head and body is of a rich chestnut-brown, while the sides are of a dark brown densely spotted with black. A narrow blackish line, sometimes running on a raised ridge or series of longitudinal folds, often separates the two areas; zigzag dark bars sometimes run across the back, and there is frequently a dark cross-bar between the posterior part of the eyes. The lips are more or less mottled and the throat feebly irrorated."

Habitat. Andamans and Tenasserim.

8. *Rana greenii*.

Rana vittigera, part., Günth., *Cat. Batr. Sal.* p. 9 (1858).

Rana gracilis, part., Günth., *Rept. Brit. Ind.* p. 409 (1864); Bouleng., *Cat. Batr. Ecaud.* p. 28 (1882).

Rana limnocharis, part., Bouleng., *Faun. Ind., Rept.* p. 450 (1890).

Rana greenii, Bouleng., *Spol. Zeyl.* II, 1904, p. 74.

Rana limnocharis, subsp. *greenii*, Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 134.

Vomerine teeth in rather strong oblique series between and extending posteriorly well beyond the choanae.

Head as long as broad, exceptionally slightly longer or slightly broader, moderately depressed; snout rounded or obtusely pointed, as long as or a little longer than the eye, projecting more or less beyond the mouth; canthus rostralis very obtuse; loreal region oblique, concave; nostril equidistant from the eye and the tip of the snout; the distance between the nostrils a little greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{2}{3}$ the diameter of the eye and about twice its distance from the latter.

Fingers obtusely pointed, first and second equal or first extending very slightly beyond the second, third as long as or a little longer than the snout; subarticular tubercles well developed and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, about twice in length from snout to vent, as long as or a little shorter than the foot, as long as or a little shorter than the fore limb. Toes obtusely pointed, not quite $\frac{1}{2}$ webbed, 3 phalanges of fourth free; outer metatarsals united in the basal third; subarticular tubercles rather small but very prominent; tarsal fold absent or reduced to the distal half; inner metatarsal tubercle very small, oval, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the inner toe; outer metatarsal tubercle indistinct, or confluent with the dermal fold of the outer toe.

Skin smooth above, with 4 to 8 very prominent, continuous or interrupted glandular folds along the back, these folds usually straight and very regular; sides with granules and short glands; a rather indistinct fold usually present across the head, behind the eyes; a curved glandular fold from the eye to the shoulder. Lower parts smooth.

Brown above, with black spots on the body, dark vertical bars on the lips, and more or less regular cross-bars on the limbs; the dorsal folds sometimes edged with blackish; a narrow or broad yellowish vertebral streak constantly present. Lower parts white, throat sometimes spotted or marbled with brown.

Male with a vocal sac on each side, forming loose folds on the throat, the sides of which are greyish; minute granular excrescences on the back; fore limbs very robust; a strong pad on the inner side of the first finger.

Measurements in millimetres (all type specimens).

	1.	2.	3.	4.	5.	6.	7.	8.	9.
	♂	♀	♀	♀	♂	♂	♀	♀	♀
From snout to vent ..	36	42	38	37	38	37	50	47	35
Head ..	11	14	13	13	13	13	16	16	11
Width of head ..	11	14	13	13	14	13	16	16	11
Snout ..	4	5	5	5	4.5	4.5	6	5.5	4
Eye ..	4	4	4	4	4.5	4.5	6	5.5	4
Interorbital width ..	2.5	3	3	3	2.5	2.5	3	2.5	2.5
Tympanum ..	2.5	2.5	2.5	2.5	2.5	2.5	3	3	2.5
Fore limb ..	19	23	23	21	21	22	30	26	19

	1.	2.	3.	4.	5.	6.	7.	8.	9.
	♂	♀	♀	♀	♂	♂	♀	♀	♀
First finger ..	3.5	4	4	4.5	4	4	5.5	5	4
Second finger ..	3.5	4	4	4	4	4	5.5	5	3.5
Third finger ..	5	6	6	5	5	5	7	7	5
Fourth finger ..	3	4	4	4	4	3.5	4	4	3
Hind limb ..	58	72	70	64	60	61	78	77	60
Tibia ..	19	23	21	19	18	18	25	24	17
Foot ..	19	23	23	22	20	20	26	26	19
Third toe ..	10	12	12	11	11	11	14	14	11
Fourth toe ..	16	19	19	17	17	17	22	22	16
Fifth toe ..	10	13	12	11	11	11	15	14	10

1—2. *Punduloya*. 3—4. *C. Ceylon*. 5—9. *Ceylon*.

Habitat. Hills of Central Ceylon.

This frog is closely allied to *R. limnocharis*, but I have no hesitation in regarding it as entitled to specific rank. It is easily distinguished by a combination of characters: first and second fingers equal or nearly so, diameter of tympanum not greater than interorbital width, outer metatarsal tubercle absent or very indistinct, inner metatarsal tubercle usually smaller.

9. *Rana brevipalmata*.

Rana brevipalmata, Peters, *Mon. Berl. Ac.* 1871, p. 646; Bouleng., *Spol. Zeyl.* II, 1904 p. 73; Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 134.
Rana gracilis, part., Bouleng., *Cat. Batr. Ecaud.* p. 28 (1882).

Vomerine teeth in rather strong oblique series between and extending posteriorly beyond the choanæ.

Head as long as broad or slightly longer than broad, moderately depressed; snout rounded or pointed, as long as or a little longer than the eye, projecting more or less beyond the mouth; canthus rostralis very obtuse; loreal region oblique, concave; nostril usually a little nearer the end of the snout than the eye; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye and $1\frac{1}{2}$ to $1\frac{1}{4}$ times its distance from the latter.

Fingers obtusely pointed, first longer than the second, third as long as or a little longer than the snout; subarticular tubercles well developed and very prominent.

Hind limb very long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to slightly less than 2 times in length from snout to vent, shorter than the foot, a little longer or a little shorter than the fore limb. Toes rather pointed, very slender, barely $\frac{1}{2}$ webbed, the web not reaching the second phalanx; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent; tarsal fold absent or reduced to the distal half; inner metatarsal tubercle strong, elliptic, compressed, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the inner toe; a rather indistinct outer metatarsal tubercle.

Back with elongate glandular warts or interrupted longitudinali-

nal folds; a curved fold from the eye to the shoulder. Lower parts smooth.

Greyish or reddish-brown above, with blackish spots which may be confluent to form two or four bands along the back; dark vertical bars on the lips, two of which usually proceed from the eye; an oblique light streak from the eye to the shoulder; limbs with more or less regular dark cross-bars; hinder side of thighs yellow, marbled with black; a narrow or broad yellow vertebral streak constantly present; often a yellow line along the calf. Lower parts white.

Male with a vocal sac on each side, forming folds on the throat¹ the sides of which are black; minute granular excrescences on the back and sides and also, very crowded, on the throat and belly during the breeding season; fore limb rather robust; a strong pad on the inner side of the first finger.

Skull as in *R. limnocharis*.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.
	♀	♂	♂	♀	♂	♂	♂
From snout to vent ..	47	40	46	35	47	45	41
Head ..	17	15	15	12	17	16	15
Width of head ..	17	15	15	11	17	16	15
Snout ..	6	5	5	4	7	6	5
Eye ..	6	5	5	4	6	5	5
Interorbital width ..	2.5	2.5	2.5	2	2.5	2	2
Tympanum ..	3	3	3	2	3	3	3
Fore limb ..	27	23	26	20	27	26	24
First finger ..	6	5	5	4	6	6	5
Second finger ..	5	4	4	3	5	5	4
Third finger ..	7	5	6	5	7	6	5.5
Fourth finger ..	5	3	4	3	4	4	3.5
Hind limb ..	90	73	88	60	87	82	71
Tibia ..	29	22	27	19	26	25	21
Foot ..	32	25	30	22	30	29	24
Third toe ..	17	14	15	11	16	16	13
Fourth toe ..	27	21	25	18	25	25	21
Fifth toe ..	18	14	15	11	16	16	13

1. Nilgiris. 2. Malabar. 3—4. Devicolum, Travancore. 5—7. Piermud, Travancore.

Habitat. Hills of Southern India. The type specimen, preserved in the Berlin Museum, is labelled as from Pegu, purchased of a dealer.

The longer hind limbs distinguish this species from the typical *R. limnocharis*, but not from the var. *nilagirica*; it differs however from both in the much shorter web between the toes, and, although one might feel inclined to regard *R. brevipalmata* as one of the local varieties of *R. limnocharis*, I am of opinion that it deserves the rank assigned to it by Peters.

¹ In one of the specimens (Malabar) there is a single, very strong fold, on each side, touching the lower border of the base of the arm, thus foreshadowing the condition of the cleft in the African *R. bibroni*.

10. *Rana grunniens*.

Rana grunniens, part., Daud., *Hist. Rain. Gren. Crap.* p. 65, pl. xxi (1803) and *Hist. Rept.* VIII, p. 127 (1803)

Rana subsaltans, Gravenh., *Delic. Mus. Vratisl.*, p. 35, pl. vii (1829).

Rana hydromedusa (Kuhl), Tschudi, *Class. Batr.* pp. 40, 80 (1838).

Rana grunniens, Dum. et Bibr., *Exp. Gén. VIII*, p. 380 (1841); Günth., *Cat. Batr. Sal.* p. 10 (1858); Bouleng., *Cat. Batr. Ecaud.* p. 23 (1882), *Tr. Zool. Soc.* XX, 1914, p. 239, and *Ann. and Mag. N.H.* (9) 1, 1918, p. 238.

? *Rana macrodon*, Van Kampen, *Nova Guinea*, IX (Zool.), p. 458 (1913).

Vomerine teeth in long and strong oblique series behind the level of the choanae. Tooth-like processes of lower jaw absent or very feebly developed

Head a little broader than long, much depressed; snout rounded, feebly projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis very obtuse; loreal region very oblique, scarcely concave; nostril nearer the tip of the snout than the eye; the distance between the nostrils equal to or a little less than the interorbital width, which equals that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye and $\frac{3}{4}$ to once its distance from the latter.

Fingers rather short, with slightly swollen tips, first much longer than the second, third as long as or a little longer than the snout; second and third fingers with a narrow dermal border; subarticular tubercles moderately large, moderately prominent.

Hind limb moderately long; tibio-tarsal articulation reaching the eye; heels meeting when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, a little over twice to $2\frac{1}{2}$ times in length from snout to vent, a little shorter than the fore limb, as long as or a little longer than the foot.

Toes with the tips dilated into small discs, webbed to the discs; subarticular tubercles rather small, moderately prominent; a short tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth above or with small scattered warts; a narrow, short, straight glandular fold, more or less distinct from behind the upper eyelid to the scapular region or the anterior part of the back; a stronger fold above the tympanum; posterior part of the upper eyelid with small warts. Lower parts smooth.

Brown above, uniform or with darker marblings; a yellowish cross-bar, edged with dark brown in front and behind, between the eyes; a dark canthal and temporal streak; lips with more or less distinct vertical dark bars; limbs with or without dark cross-bars. Lower parts white; throat sometimes spotted or marbled with brown.

Male without secondary sexual characters.

Nasals large and in contact with each other and with the frontoparietals, which bear a feeble sagittal crest posteriorly; ethmoid not exposed; zygomatic process of squamosal long, extending to below the eye. Omosternum forked at the base. Terminal phalanges feebly expanded at the end.

Measurements in millimetres.

			1.	2.	3.	4.
			♂	♂	♀	♀
From snout to vent	..	..	70	82	107	83
Head ..	..	..	23	29	36	28
Width of head ..	..	..	27	32	41	31
Snout ..	..	..	9	11	13	10
Eye ..	..	..	9	9	11	9
Interorbital width	..	..	5	5	6	5
Tympanum ..	..	..	5	5	7	5
Fore limb ..	..	..	40	44	54	43
First finger ..	..	..	9	9	11	9
Second finger ..	..	..	7	7	9	7
Third finger ..	..	..	10	10	12	10
Fourth finger ..	..	..	7	7	9	7
Hind limb ..	..	..	98	125	154	122
Tibia ..	..	..	30	40	48	37
Foot ..	..	..	31	40	48	41
Third toe ..	..	..	17	24	27	23
Fourth toe ..	..	..	26	35	38	33
Fifth toe ..	..	..	19	25	30	24

1. Java (?). 2—4. Mimika R., Dutch New Guinea.

The type, from Amboyna, preserved in the Paris Museum, measures 146 millim. from snout to vent.

Habitat. Amboyna and Dutch New Guinea. The occurrence of this frog in Java is very doubtful.

II. *Rana macrodon*.

Rana macrodon (Kuhl), Dum. et Bibr., *Erp. Gén.* VIII, p. 382 (1841); Günth., *Cat. Batr. Sal.* p. 8 (1858); Peters, *Mon. Berl. Ac.* 1871, p. 650; Blanf., *Proc. Zool. Soc.* 1881, p. 225, pl. xxi, fig. 4; Bouleng., *Cat. Batr. Ecaud.* p. 24 (1882), and *Faun. Ind., Rept.* p. 448 (1890); S. Flower, *Proc. Zool. Soc.* 1896, p. 898, pl. xiv, fig. 1, and 1899, pp. 888 and 916, pl. lix, fig. 1; Boettg., *Abh. Senck. Ges.* XXV, 1903, p. 366; A. L. Butler, *Fourn. N. H. Soc. Bomb.* XV, 1903, p. 196; Isenschmid, *Mitth. Nat. Ges. Bern*, 1903, p. 6; Van Kampen, *Nat. Tijdschr. Ned. Ind.* LXIX, 1909, p. 32; Bouleng., *Faun. Mal. Pen., Rept.* p. 233 (1912).

Rana fusca (non Meyer), Blyth, *Fourn. As. Soc. Beng.* XXIV, 1855, p. 719; Anders., *Proc. Zool. Soc.* 1871, p. 197; Stoliczka, *Fourn. As. Soc. Beng.* XII, 1873, p. 115; Anders., *Anat. Zool. Res. Yunnan*, p. 837 (1879).

Ixalus aurifasciatus, Peters, *Mon. Berl. Ac.* 1863, p. 455.

As pointed out by Blanford and by S. Flower, this species presents two extreme forms which one might think at first worthy of specific distinction. The comparison of a large material shows, however, that such a separation is not feasible. I have endeavoured to keep the two distinct, regarding as the typical form the 'broad-headed form' of Flower and bestowing the name var. *blythii* on Blyth's *R. fusca* (a name which is preoccupied) for Flower's "narrower-headed variety." I must say the definition of the latter is not very precise, as almost every character suffers individual exceptions and some specimens might as well be referred to the one form as to the other. Such are the characters of the shape of the head, of the size of the eye and of the tympanum, and especially of the extent of the web between the toes, the two

extremes being completely connected. The differences in the coloration on which Flower laid stress at first, have since been shown by himself to be inconstant.

Forma typica.

Vomerine teeth in long and strong, straight or slightly curved, oblique series between the choanae and extending much beyond the level of their posterior borders; in young specimens often shorter, less oblique, and entirely behind the choanae. Lower jaw with two bony prominences in front, feebly developed and barely indicated in females, large, acutely pointed, directed backwards, and fitting into deep pits in the upper jaw, in adult males.

Head large, especially in males, much depressed, the sides of the occiput very swollen in males, broader than long; snout rounded or obtusely pointed, feebly or slightly projecting beyond the mouth, as long as or, usually, longer than the eye, which may be rather small in the adult; canthus rostralis very obtuse, sometimes very indistinct; loreal region very oblique, slightly concave; nostril much nearer the end of the snout than the eye; the distance between the nostrils equal to or less than the interorbital width in the adult; interorbital width 1 to $1\frac{1}{2}$ times that of the upper eyelid, narrower in the young; tympanum very distinct, $\frac{3}{8}$ to $\frac{5}{8}$ the diameter of the eye and $\frac{2}{3}$ to once its distance from the latter.

Fingers rather short or moderate, obtuse or slightly swollen at the end, first much longer than the second, third as long as or a little shorter than the snout; second and third usually with a more or less distinct dermal fold on each side; subarticular tubercles moderate, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout, the heels more or less overlapping, sometimes very slightly, when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, $1\frac{1}{2}$ to $2\frac{1}{2}$ times in length from snout to vent, usually shorter than the fore limb, as long as or a little longer than the foot. Toes moderately long, the tips dilated into very small discs, entirely webbed, the web always reaching the discs but rather strongly emarginate and usually forming only a narrow border to the penultimate phalanx of the fourth; subarticular tubercles moderately large, moderately prominent; a short and feeble tarsal fold, sometimes indistinct; inner metatarsal tubercle narrow, feebly prominent, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the inner toe; no outer tubercle.

Skin smooth or warty above; sometimes a transverse fold across the head, behind the eyes; a strong glandular fold from the eye to the shoulder, often forming an angle above the tympanum; posterior part of upper eyelids warty; young with a narrow glandular fold on each side of the back, beginning behind the upper eyelid, sometimes very short. Lower parts smooth.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
From snout to vent	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♀	♀
Head	..	150	128	123	110	108	100	70	127	96	95	94	135	116	118	96	90
Width of head..	..	61	50	45	40	37	36	26	46	34	32	35	53	48	46	38	31
Snout	..	76	61	57	47	43	40	30	55	38	35	40	60	49	54	42	33
Eye	..	21	19	17	15	13	13	10	17	14	11	12	19	17	15	11	10
Interorbital width	..	14	13	12	12	11	11	8	12	12	10	10	12	14	12	11	10
Tympanum	..	15	13	10	7	8	7	5	9	7	7	7	12	9	12	7	7
Fore limb	..	10	9	9	7	7	7	5	10	7	7	7	10	9	8	7	6
First finger	..	82	75	70	65	60	55	44	79	56	54	55	71	66	67	57	49
Second finger	..	20	17	18	14	13	12	9	16	12	12	11	18	15	16	14	12
Third finger	..	14	13	12	10	10	9	7	12	8	9	9	13	12	13	11	9
Fourth finger	..	20	18	18	14	14	12	9	17	13	13	12	18	16	16	14	13
Hind limb	..	14	12	13	11	9	8	6	10	8	8	8	11	10	11	11	9
Tibia	..	205	202	180	160	156	143	119	175	160	154	142	200	172	180	153	137
Foot	..	68	70	64	60	54	47	39	57	51	50	46	64	58	57	49	46
Third toe	..	62	64	55	51	47	43	36	54	47	45	45	58	56	56	49	45
Fourth toe	..	33	30	27	25	22	22	18	27	23	24	22	28	31	29	25	21
Fifth toe	..	52	49	42	40	38	36	28	45	40	38	36	47	47	46	43	35
	..	37	33	28	27	25	23	19	31	27	27	24	32	34	31	30	25

1—8. Singapore. 9. Great Natuna Id. 10—11. Sandakan, N. Borneo. 12. Sarawak. 13—14. Java. 15. Lombok. 16—17. Flores.

Yellowish-red to chocolate red, brownish olive, or dark olive, with or without small darker spots; a dark chevron or a yellowish, dark-edged band sometimes present between the eyes, in young specimens; temporal fold dark-edged; a large black temporal spot in some young; lips usually with dark spots or vertical bars; two of these bars, from the eye to the mouth, usually very distinct in the young; sides sometimes speckled with blackish; limbs with or without more or less distinct dark bars; hinder sides of thighs speckled, spotted or marbled with black; a yellow or orange vertebral streak or fine line sometimes present; rarely a fine yellow line along the thigh and the inner side of the calf. Throat white or brown, belly and lower surface of limbs yellow or pale orange, uniform or spotted or speckled with brown.

Males without vocal sacs; the fore limbs neither thickened nor bearing nuptial excrescences; differing from females by the larger head and the tooth-like prominences in front of the lower jaw.

Nasals large, in contact with each other and with the frontoparietals, which may be fused behind and bear a strong sagittal crest in the adult, the crest bifurcate at the occipital extremity; ethmoid covered over; zygomatic branch of squamosal very long, reaching the eye. Omosternal style forked at the base. Terminal phalanges slightly expanded at the end.

Tadpole with the tail twice or more than twice as long as the body, acutely pointed or ending in a filament, the dorsal crest not extending to the base of the tail. Beak broadly edged with black; a long marginal series of upper labial teeth and a short series on each side; 3 series of lower labial teeth, outer short and uninterrupted, second long and uninterrupted, third interrupted in the middle. Light reddish-brown; a dark brown line through the eyes, sometimes other darker lines radiating from the eye; tail with irregular dark brown vertical bars.

[The tadpole lives in jungle streams in places where the bottom is sandy. The dark irregular bars on the tail aid greatly in concealing it in such places.—N. A.].

Eggs measuring 2 millim. in a female 135 millim. from snout to vent.

A specimen from Singapore, preserved in the Raffles Museum, measures 230 millim. from snout to vent, according to A. L. Butler, thus very nearly of the size of the African *R. gohath*, Blgr.

Habitat. Singapore, Natunas, Engano, Borneo, Java, Lombok, Flores, Halmaheira, Batjan.

Var. *blythii*.

Head narrower than usual in the typical form, often as long as broad or a little broader than long, rarely slightly longer than broad; eye usually larger, canthus rostralis more distinct, and loreal region less oblique; tympanum often smaller, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye, $\frac{1}{2}$ to once its distance from the latter. Tibio-tarsal articulation sometimes reaching the tip of the snout; tibia

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.
	♀	♀	♀	♂	♂	♀	♀	♂	♀	♂	♀	♀	♀	♀	♂	♂	♂	♂	♀	♂	♂	♀	♀	♀	♀	♂	♂	♀
From snout to vent	135	123	103	88	85	85	80	108	88	90	78	76	75	83	78	131	125	125	79	108	128	117	74	70	89	100	87	95
Head	48	44	33	36	32	31	28	43	31	36	30	27	27	29	30	52	52	51	26	40	50	40	27	26	34	37	33	32
Width of head	53	47	37	36	34	31	26	47	33	36	30	28	27	28	30	52	52	53	26	40	50	44	27	26	34	37	34	35
Snout	17	17	12	12	12	12	10	14	11	14	11	10	10	11	11	19	18	18	10	15	19	14	10	9	11	13	12	12
Eye	17	14	12	10	10	10	9	13	11	12	11	10	9	10	10	15	14	15	10	12	15	13	10	9	11	11	11	12
Interorbital width	9	8	6	6	7	5	5	9	5	7	5	4	4	5	5	10	10	10	4	8	10	6	5	4	6	6	6	6
Tympanum	8	7	6	6	5	6	6	8	5	7	6	5	5	5	5	7	8	7	4	5	7	8	5	5	5	5	5	5
Pore-limb	73	67	57	47	49	51	42	55	50	50	45	45	42	45	44	70	69	69	43	60	70	60	40	40	47	58	51	53
First finger	17	15	12	11	11	11	10	14	12	12	10	11	10	11	9	15	15	16	10	13	16	15	10	10	10	14	11	12
Second finger	13	12	10	8	8	8	8	12	9	9	8	8	7	9	7	13	12	12	7	9	13	12	8	8	8	11	10	11
Third finger	17	15	13	11	12	11	10	15	13	12	11	11	10	12	10	17	16	17	10	14	18	15	10	10	10	15	13	13
Fourth finger	11	10	9	7	8	7	7	10	8	8	7	7	6	8	6	12	11	13	7	10	13	10	7	7	7	11	9	10
Fifth finger	216	208	172	143	143	127	180	151	142	130	127	123	125	118	215	202	218	126	190	213	177	114	113	123	160	146	148	148
Hind limb	71	67	56	46	48	48	42	60	50	48	42	42	41	40	38	70	66	70	43	63	73	59	38	37	41	51	45	47
Tibia	67	62	52	42	44	42	39	57	46	45	40	40	38	40	37	63	58	64	39	57	65	54	37	37	39	50	45	46
Foot	37	34	26	23	25	23	22	33	25	24	22	21	21	22	19	36	31	35	22	35	37	29	19	18	20	28	24	23
Third toe	56	52	45	35	36	31	46	38	37	32	33	31	33	31	33	53	49	53	32	50	54	45	30	30	30	42	38	40
Fourth toe	43	40	33	26	27	24	23	33	28	27	23	23	22	24	22	41	37	41	25	37	42	32	22	20	23	33	27	28
Fifth toe																												

1—3. Tenasserim. 4—5. Nakon si Tamarat, Siam. 6—7. Gunong Pahan, Johore. 8—9. Larut hills, Perak. 10—13. Penang hills. 14—15. Nias. 16—19. Sarawak. 20. Bongon, N. Borneo. 21. Mt. Dulit, N. Borneo. 22. Merabak, N. Borneo. 23. Palawan. 24. Balabak. 25. Mindanao. 26. Zamboango, Philippines. 27—28. Dinagat Island, Philippines.

often as long as or but slightly shorter than the fore limb; toes often less broadly webbed. Olive-brown or green above, rarely reddish; a yellow vertebral streak or broad band rarely present.

As stated above the distinction of this variety is rather vague and the naming of certain specimens is therefore arbitrary.

Habitat. Burma, Annam, Siam, Malay Peninsula, Sumatra, Borneo, Philippines.

12. *Rana magna*.

Rana macrodon, part., Bouleng., *Cal. Batr. Ecaud.*, p. 24 (1882).

Rana magna, Stejneger, *Smiths. Misc. Coll.* I.II, 1909, p. 437.

Rana modesta, part., Roux, *Rev. Suisse Zool.* XXVI, 1918, p. 411.

Vomerine teeth in moderately long oblique series between the choanae and extending beyond the level of their posterior borders, or just behind them. Lower jaw with two bony prominences in front, feebly developed and obtuse in females, large and acutely pointed, directed backwards, in adult males.

Head large, especially in males, much depressed, the sides of the occiput very convex in males, broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis more or less distinct, sometimes rather strong; loreal region moderately oblique, concave; nostril much nearer the end of the snout than the eye; the distance between the nostrils equal to or less than the interorbital width in the adult; interorbital width equal to or a little greater than that of the upper eyelid, narrower in the young; tympanum very distinct, $\frac{1}{4}$ to $\frac{2}{3}$ the diameter of the eye, $\frac{1}{3}$ to once its distance from the latter.

Fingers moderate, the tips dilated into very small discs, first longer than the second, third as long as or a little longer than the snout, second and third with a narrow dermal fold on each side; subarticular tubercles rather large, very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye, the heels just meeting when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, nearly 2 to $2\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot.

Toes moderately long, the tips dilated into rather large discs ($\frac{1}{4}$ to $\frac{1}{2}$ diameter of tympanum), very broadly webbed, the membrane reaching the discs of all the toes; subarticular tubercles moderately large, very prominent; a short and feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent, about $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Upper parts with small tubercles or flat warts; sometimes a transverse fold across the head, behind the eyes; a strong glandular fold from the eye to the shoulder; young with a narrow glandular fold on each side of the back, beginning behind the upper eyelid. Lower parts smooth.

Brown above (in spirit), uniform or with ill-defined darker spots and a cross-bar between the eyes; limbs with dark cross-

bars; hinder side of thighs marbled with dark brown, or dark brown with small light spots; young with a light streak from below the eye to the shoulder, below a dark brown temporal spot. Lower parts white, uniform or, usually, spotted or mottled with brown.

Males with internal vocal sacs; other secondary sexual characters as in *R. macrodon*.

Egg small, vitelline sphere measuring 2 millim. in diameter in female 92 millim. long from snout to vent.

Skeleton as in *R. macrodon*, but extremity of last phalanx of toes with stronger transverse expansion.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.
	♂	♂	Hg.	♂	♀	♀
From snout to vent ..	113	108	56	120	79	92
Head ..	46	44	21	45	31	34
Width of head ..	52	48	22	50	33	36
Snout ..	15	14	8	16	11	12
Eye ..	13	12	8	13	11	11
Interorbital width ..	11	11	4	11	6	7
Tympanum ..	5	5	3	5	3	4
Fore limb ..	60	58	33	67	48	55
First finger ..	15	13	8	17	11	12
Second finger ..	11	11	6	13	9	11
Third finger ..	15	13	9	17	12	14
Fourth finger ..	11	10	5	13	8	11
Hind limb ..	165	157	85	168	127	141
Tibia ..	51	49	28	53	41	45
Foot ..	55	50	28	56	40	45
Third toe ..	28	27	13	29	21	26
Fourth toe ..	43	40	22	46	33	39
Fifth toe ..	30	30	15	35	25	30

1—3. Laguna del Bay, Luzon. 4—5. Negros. ♂. S. Celebes, 2000 f.

Habitat. Philippines, Celebes. Stejneger records the species from Mindanao, Basilan, Mindoro and Luzon.

13. *Rana modesta*.

Rana macrodon, part., Dum. et Bibr., *Erp Gén.* VIII, p. 382 (1841).

Rana modesta, Bouleng., *Cat. Batr. Ecaud.* p. 25, pl. i, fig. 3 (1882); F. Müll., *Verh. Nat. Ges. Basel.* X, 1894, p. 367; Bouleng., *Proc. Zool. Soc.* 1897, p. 223; Boettg., *Abh. Senck. Ges.* XXV, 1903, p. 382; Van Kampen, in M. Weber, *Zool. Ergebn.* IV, p. 385 (1907)

Vomerine teeth in moderately long, strong, oblique series originating between the choanae and extending beyond the level of their posterior borders, or entirely behind them. Lower jaw with two bony prominences in front, feebly developed in females, moderately large and acutely pointed in males.

Head moderate, much depressed, as long as broad or a little broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or slightly shorter than the eye; canthus rostralis distinct, rather obtuse; loreal region moderately oblique, concave; nostril a little nearer the end of the

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
From snout to vent	..	70	55	70	66	64	62	59	57	51	53	72	46	46	59	58
Head	26	23	24	22	21	22	21	21	20	21	28	18	18	20	20
Width of head	..	27	26	20	25	23	22	22	21	20	21	30	18	18	20	21
Snout	9	7	8	7	7	7	7	6	6	7	9	6	6	7	7
Eye	9	7	8	7	7	7	7	7	6	7	9	6	6	7	7
Interorbital width..	..	4	4	3	4	3.5	4	3	3	3	3	5	3	3	3	3.5
Tympanum	..	4	4	4	4	4	4	3.5	4	3	3	4	2.5	2.5	3	3
Fore limb	..	37	33	39	37	40	37	35	35	31	32	45	29	29	35	33
First finger	..	9	8	8	8	9	8	7	8	7	7	9	7	7	8	7
Second finger	..	7	7	7	7	8	7	6	7	6	6	8	6	6	7	6
Third finger	..	10	8	8	8	10	9	8	8	8	8	12	8	8	9	8
Fourth finger	..	6	6	5	6	6	6	6	6	5	5	9	5	5	6	6
Hind limb	..	95	96	84	105	106	97	93	87	83	85	122	75	75	88	88
Tibia	31	32	27	34	31	32	29	27	26	27	37	24	24	29	29
Foot	32	33	27	34	31	31	30	30	26	27	39	24	25	29	29
Third toe	..	18	18	13	17	17	16	15	15	13	14	21	11	12	15	15
Fourth toe	..	25	26	20	26	25	27	25	23	20	22	33	19	20	22	22
Fifth toe	..	19	19	13	19	19	16	16	17	14	16	24	13	14	16	15

1.—10. Gorontalo, types. 11. Manado, types. 12. Bonthain Peak, 6500 ft. 13.—16. S. Celebes.

snout than the eye; the distance between the nostrils equal to or greater than the interorbital width, which is nearly equal to or less than that of the upper eyelid; tympanum very distinct, $\frac{1}{4}$ to $\frac{3}{8}$ the diameter of the eye, $\frac{2}{3}$ to $1\frac{1}{2}$ times its distance from the latter.

Fingers moderate, the tips swollen or dilated into very small discs, first longer than the second, third as long as or a little longer than the snout; subarticular tubercles moderate, moderately prominent.

The tibio-tarsal articulation reaches the eye or between the eye and the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, nearly 2 to $2\frac{1}{4}$ times in length from snout to vent, shorter than the fore limb, as long as or a little longer or a little shorter than the foot. Toes moderately long, the tips dilated into very small discs, entirely or nearly entirely webbed; subarticular tubercles rather small, moderately prominent; a short and feeble tarsal fold, sometimes absent; inner metatarsal tubercle moderately prominent, narrow, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Upper parts smooth or with small warts or interrupted longitudinal folds; upper eyelids tubercular; sometimes a transverse fold behind the eyes; a glandular fold from the eye to the shoulder. Lower parts smooth.

Brown, grey-brown, or dark olive above, with or without rather indistinct darker spots; sometimes two lighter strips on the back and the canthi rostrales, meeting on the tip of the snout; sometimes a light vertebral stripe; a dark cross-band between the eyes often present; a black spot sometimes present on the tympanum; upper lip with dark vertical bars, two below the eye; limbs with dark cross-bands; hinder side of thighs dark brown, with light spots or marblings. Lower parts white, uniform or speckled or spotted with brown.

Males with internal vocal sacs; the head rather larger than in females.

Osteological characters as in *R. macrodon*.

Eggs rather large, $2\frac{1}{2}$ millim. in diameter in female measuring 58 millim. from snout to vent.

Habitat. Celebes, Talaut Ids., Nusa Laut and Saleyer.

Closely allied to *R. macrodon*, but much smaller, vomerine teeth in shorter series, and males with vocal sacs. Although the latter character justifies its specific separation, it is not easy to distinguish it from young specimens of *R. macrodon* of the same size.

14. *Rana microtympanum*.

Rana microtympanum, Van Kampen, in M. Weber, *Zool. Ergebn.* IV, p. 386 (1907).

Vomerine teeth in short, oblique series just behind the level of the choanae. Lower jaw with short, obtuse, tooth-like processes in front.

Head as long as broad; snout rather pointed, shorter than the orbit; canthus rostralis distinct; loreal region feebly oblique, concave; nostril equidistant from the eye and the tip of the snout; interorbital space as broad as or a little narrower than the upper eyelid; tympanum distinct, $\frac{1}{3}$ the size of the eye.

Fingers rather swollen at the end, first as long as or a little shorter than the second.

Tibio-tarsal articulation reaching between the eye and the tip of the snout. Toes ending in small but distinct discs, entirely webbed; subarticular tubercles moderate; a tarsal fold; inner metatarsal tubercle narrow, $\frac{1}{2}$ or rather more than $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Back warty; a rather strong fold above the tympanum; posterior part of upper eyelid with small warts; a transverse fold across the head, behind the upper eyelids. Lower parts smooth.

Brown above, with ill-defined darker spots; a dark cross-bar, light-edged in front, between the eyes; limbs with dark cross-bands. Yellowish beneath, with or without brown marbling on the throat.

Tadpole with the tail less than twice the length of the body and with obtuse point. Beak narrowly edged with black; labial teeth in 2 upper and 2 lower series, the inner series interrupted.

Habitat. Celebes.

This species is founded on apparently young specimens, 32 millim. from snout to vent. The shorter first finger appears to distinguish the species from its allies.

Roux (*Rev. Suisse Zool.* XXVI, 1918, p. 412) may be right in regarding *R. microtympanum* as a synonym of *R. modesta*. However, I have examined a young *R. modesta* from Buol, Celebes, measuring 30 mm., and which has the first finger a little longer than the second.

15. *Rana doriae*.

Rana gracilis, var. *andamanensis*, part., Stoliczka, *Journ. As. Soc. Beng.* XXXIX, 1870, p. 142.

Rana doriae, Bouleng., *Ann. Mus. Genov.* (2) V, 1887 p. 482, pl. iii, fig. 1 and *Faun. Ind., Rept.*, p. 447 (1890); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 135.

Rana doriae, part., Bouleng., *Faun. Mal. Pen., Rept.* p. 231 (1912).

Vomerine teeth in oblique oval groups behind the level of the choanae. Lower jaw without bony prominences in front

Head moderate, moderately depressed, a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region moderately oblique, slightly concave; nostril nearly equidistant from the eye and the end of the snout; the distance between the nostrils equal to or a little greater than the interorbital width, which is nearly equal to that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{2}{3}$ the diameter of the eye, $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers moderate, the tips swollen into very small discs, first a little longer than the second, third as long as or a little longer than the snout; subarticular tubercles moderate.

The tibio-tarsal articulation reaches the eye or the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, $1\frac{1}{2}$ to $2\frac{1}{2}$ times in length from snout to vent, as long as or a little shorter than the fore limb, as long as or a little longer than the foot. Toes moderately long, the tips dilated into small but very distinct discs, $\frac{1}{2}$ to nearly entirely webbed, 1 or 2 phalanges of fourth free; subarticular tubercles moderate; a feeble tarsal fold; inner metatarsal tubercle moderately prominent, $\frac{2}{3}$ to $\frac{3}{4}$ the length of the inner toe; no outer tubercle.

Skin smooth or with irregular glandules on the back; a more or less distinct fold across the head, behind the upper eyelids; a strong glandular fold from the eye to the shoulder.

Brown above, with small irregular darker spots; sometimes a yellowish vertebral stripe; a dark cross-band between the eyes, bordered with yellowish in front; lips with dark vertical bars; limbs with rather irregular dark cross-bands. Lower parts white, uniform or scantily spotted with brown.

Males without vocal sacs.

Nasals large, in contact with each other and with the frontoparietals; ethmoid covered over; zygomatic branch of squamosal long.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
	♂	♂	♂	♀	♀	♀	♀	♂	♀
From snout to vent ..	48	48	47	50	48	45	43	43	44
Head.. ..	18	18	18	18	17	16	16	16	16
Width of head ..	20	20	20	19	18	17	17	18	17
Snout ..	6	6	6	7	6	5.5	5	6	6
Eye ..	6	6	6	6	6	5.5	5	6	6
Interorbital width ..	4	5	4	4	3.5	3	3	4	4
Tympanum ..	4	4	3.5	4	3	3	3	4	4
Fore limb ..	27	28	27	27	26	25	26	25	25
First finger ..	5.5	6	6	5.5	5.5	5	5.5	5.5	5.5
Second finger ..	5	5	5.5	5	5	4.5	5	5	5
Third finger ..	7	7	7	7	6.5	6	6	7	7
Fourth finger ..	5	4.5	4	4.5	4.5	4	4	4.5	4
Hind limb ..	84	82	80	84	74	67	78	76	78
Tibia ..	27	26	26	27	23	21	23	23	25
Foot ..	26	25	25	25	23	21	23	21	24
Third toe..	13	12	12	13	12	11	12	11	12
Fourth toe ..	19	18	18	19	17	16	18	17	19
Fifth toe ..	12	12	11	12	11	11	12	11	12

1—6. Tenasserim, types. 7. King Id., Mergui. 8—9. Klong Bang Lai, Siam.

Habitat. Tenasserim, Siam, Malay Peninsula. Also the Andamans, as, according to Annandale, the largest of the types of Stoliczka's *R. gracilis*, var. *andamanensis* belongs undoubtedly to this species.

16. *Rana macrognathus*.

Rana doriae, part., Bouleng., *Ann. Mus. Genova*, (2) XIII, 1893, p. 328, pl. viii. fig. 1, and *Faun. Mal. Pen., Rept.* p. 231 (1912).

Rana macrognathus, Bouleng., *Ann. and Mag. N.H.*, (8) XX, 1917, p. 414.

I now regard as deserving specific distinction a frog from Upper Burma in which the males differ from those of *R. doriae* in the very large head with strong swellings formed on the lower surface of the mandible and on each side of the occiput, by the extraordinary development of the masseteric and depressor muscles, and in which a strong pointed tooth-like process is present on each side of the mandible near the symphysis, as in *R. macrodon* and *R. kuhlii*. In these males, when fully developed, the interorbital region is broad and very convex, the swelling produced posteriorly as in *Pelobates fuscus*; the frontoparietal bones are raised in their anterior half, rugose though free from the skin, and furnished with three strong longitudinal ridges which unite into a single one on the posterior part of the bones. The tympanum of these males is nearly or quite as large as or even larger than the eye. Females are hardly distinguishable from *R. doriae*. The length of the inner metatarsal tubercle is $\frac{1}{2}$ to $\frac{2}{3}$ the length of the inner toe. The warts on the back are often more prominent than in *R. doriae*.

Measurements in millimetres.

		1.	2.	3.	4.	5.	6.
		♂	♂	♀	♂	♂	♀
From snout to vent	..	57	47	55	56	35	42
Head	..	24	19	20	22	14	15
Width of head	..	26	21	21	25	15	16
Snout	..	—	7	—	8	4.5	5.5
Eye	..	7	6	6	6.5	4.5	5.5
Interorbital width	..	—	5	—	5	3.5	3
Tympanum	..	7	5	4	5.5	4.5	3
Pore limb	..	31	25	29	32	21	24
First finger	..	—	5.5	—	6.5	4	5
Second finger	..	—	5	—	6	4	4.5
Third finger	..	—	7	—	8	5	6
Fourth finger	..	—	4.5	—	5	3.5	4
Hind limb	..	85	70	86	80	54	65
Tibia	..	28	22	28	25	17	21
Foot	..	27	22	27	25	17	20
Third toe	..	—	11	—	12	9	10
Fourth toe	..	—	17	—	20	13	15
Fifth toe	..	—	11	—	13	8	10

1—3. Karin hills (types). 4. Da Ban, S. Annam. 5. Ok Yam, S.E. Siam.
6. Koh Chang Id., Siam.

This frog is intermediate between *R. doriae* and *R. pileata*.

The types are from the Karin Hills, 1300 to 1600 feet, and from the district of the Karin Bia-po. I have received from Dr. Malcolm Smith a specimen from Annam. Small specimens from Siam (Ok Yam, Koh Kut Id., and Koh Chang Id.) appear to belong to the same form, but the male, although showing the large tympanum and the tooth-like processes of the lower jaw, lacks the swelling on the interorbital region.

17. *Rana pileata*.

Rana pileata, Bouleng., *Journ. N.H. Soc. Siam*, I, 1916, p. 104, pl.—.

Vomerine teeth in rather short, strong, oblique series just behind the level of the choanae. Lower jaw with two large, fang-like bony prominences in front, in the males.

Head moderate in females, very large in males, moderately depressed, a little broader than long; in the males, strong swellings on the lower surface of the mandible and on each side of the occiput; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, as long as or longer than the eye; canthus rostralis obtuse; loreal region moderately oblique, slightly concave; nostril nearer the tip of the snout than the eye; the distance between the nostrils equal to or a little greater than the interorbital width; interorbital region little broader than the upper eyelid in females and half-grown males, twice as broad and very convex in full-grown males; in these the frontoparietals form a swelling, as in *R. macrogathus* and *R. plicatella*; behind the interorbital region a large dermal flap in full-grown males, rounded and completely detached behind; in smaller males this flap is less developed and in females and young it is absent or represented by a faint semi-circular fold; tympanum distinct, $\frac{3}{4}$ or $\frac{5}{8}$ the diameter of the eye in females, as large as or a little larger than the eye in adult males.

Fingers moderate or rather short, blunt, first a little longer than the second, third a little longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye, the heels overlapping when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, 2 to $2\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb, as long as or a little longer than the foot. Toes moderate, the tips dilated into small discs, $\frac{3}{4}$ to nearly entirely webbed; subarticular tubercles moderate; a feeble tarsal fold; inner metatarsal tubercle feebly prominent, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin with irregular, flat glandules on the back and small tubercles on the upper eyelids; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Green, olive, or brown above, young and half-grown often with a strong tinge of red, with darker spots or marblings, or with dark edges to the dorsal glandules; a more or less distinct yellowish angular band, dark-edged behind, between the eyes; lips with dark vertical bars; some specimens with a yellow median stripe from the tip of the snout to the vent; limbs with dark cross-bars. Lower parts white or pale yellow, throat sometimes spotted with brown. Iris golden-green, veined with black and with a black cross.

Males without vocal sacs.

Ripe ova measuring 3 millim. in diameter in female 52 millim. from snout to vent.

Measurements, in millimetres, of type specimens.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
	♂	♂	♂	♂	♀	♀	♀	♂	♂
From snout to vent ..	72	64	54	50	52	52	49	50	61
Head ..	31	27	20	19	19	19	18	21	26
Width of head ..	33	30	23	22	20	21	20	23	29
Snout ..	11	10	8	7	7	7	6	8	10
Eye ..	8	7	6	6	5	6	6	6	7
Interorbital width ..	9	7	5	5	4.5	4	4	6	6
Tympanum ..	8	7	5	5	4	4	4	6	7
Fore limb ..	40	36	30	30	29	30	28	27	38
First finger ..	7.5	7	7	6	6.5	6.5	6	6	8
Second finger ..	7	6.5	6	6	6	6	5.5	5.5	7
Third finger ..	10	9	8	8	7.5	8	7	7	9
Fourth finger ..	6	5.5	5	5	5	5	4	5	5.5
Hind limb ..	107	98	88	84	82	86	80	69	101
Tibia ..	35	32	28	27	26	27	26	23	31
Foot ..	34	31	27	27	26	27	25	21	31
Third toe ..	17	15	14	14	13	15	14	11	16
Fourth toe ..	27	24	22	21	19	21	19	15	24
Fifth toe ..	17	16	15	14	13	15	14	11	17

- 1—7. Khao Seabab, Chantabun, S.E. Siam. 8. Hup Bon, Sriracha, S.E. Siam.
9. Meh Song forest, near Prae, N. Siam.

Habitat. Siam, between 600 and 3000 feet altitude.

18. *Rana plicatella*.

Rana plicatella, Stoliczka, *Journ. As. Soc. Beng.* XI.11, 1873, p. 116, pl. xi, fig. 1; Bouleng., *Cat. Batr. Ecaud.* p. 26 (1882); S. Flower, *Proc. Zool. Soc.* 1899, p. 890; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 196; Bouleng., *Faun. Mal. Pen., Rept.* p. 231 (1912).

Vomerine teeth in rather short, strong, oblique series just behind the level of the choanae. Lower jaw with two fang-like bony prominences in front in the males.

Head large (male), moderately depressed, a little broader than long; sides of the occiput very convex; snout obtusely pointed, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis very obtuse; loreal region moderately oblique, feebly concave; nostril equidistant from the eye and the tip of the snout; the distance between the nostrils equal to the interorbital width; interorbital region broader than the upper eyelid, convex and followed by a knob-like prominence; tympanum distinct, as large as or a little larger than the eye, 2 to 3 times its distance from the latter.

Fingers moderate, the tips dilated into very small but distinct discs, first slightly longer than the second, third as long as the snout; subarticular tubercles moderate.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout, or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, $1\frac{2}{3}$ to 2 times in length from snout to vent, a little shorter than the fore limb, as long as the foot. Toes moderate, the tips dilated into small but distinct discs, $\frac{2}{3}$ to $\frac{3}{4}$ webbed, 2 or 3 phalanges of fourth free; subarticular tubercles

rather small; a very slight tarsal fold; inner metatarsal tubercle narrow, prominent, about $\frac{1}{3}$ the length of the inner toe; no outer tubercle.

Skin of back with 8 or 10 glandular longitudinal folds, sometimes with numerous small tubercles between them; a strong fold above the tympanum; upper eyelids tubercular.

Bronze above, in life, changing from bright yellowish red to dull brown shades, with or without a yellow vertebral stripe; some of the dorsal folds edged with black; a black chevron, pointing backwards, between the eyes; limbs with dark brown cross-bars. Belly bright sulphur yellow. Iris bronze, with a black cross, and a very narrow red ring round the pupil.

Males without vocal sacs.

Measurements in millimetres.

				1. ♂	2. ♀
From snout to vent	..	..	..	36	34
Head	..	..	..	15	14
Width of head	..	..	..	17	16
Snout	..	..	..	5	4.5
Eye	..	..	..	5	4.5
Interorbital width	..	..	..	3.5	3.5
Tympanum	..	..	..	4.5	4.5
Fore limb	..	..	..	22	21
Hind limb	..	..	..	67	59
Tibia	..	..	..	20	18
Foot	..	..	..	20	18

1. Penang. 2. Bukit Timah, Singapore.

Habitat. Penang, hills between Kedah and Perak, up to 4000 feet, Singapore.

19. *Rana hascheana*.

Polypedates hascheanus, Stoliczka, *Journ. As. Soc. Beng.*, XXXIX, 1870, p. 147, pl. ix, fig. 3.

Rana gracilis, var. *andamanensis*, part., Stoliczka, *t. c.* p. 142.

Rana hascheana, W. Slater, *Proc. Zool. Soc.* 1892, p. 344; S. Flower, *Proc. Zool. Soc.* 1899, p. 894; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 197; Bouleng., *Faun. Mal. Pen., Rept.* p. 232 (1912).

Vomerine teeth in oblique oval groups just behind the level of the choanae. No bony prominences in front of the lower jaw.

Head moderate, moderately depressed, as long as broad or a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, slightly concave; nostril equidistant from the eye and the tip of the snout; the distance between the nostrils a little greater than the interorbital width, which equals that of the upper eyelid; tympanum distinct, $\frac{1}{3}$ to $\frac{1}{2}$ the diameter of the eye and $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers rather short, the tips scarcely dilated, first as long as or slightly longer than the second, third as long as or slightly shorter than the snout; subarticular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ to 4 times as long as broad, $1\frac{3}{8}$ to 2 times in length of head and body, as long as or a little shorter than the fore limb, as long as or a little longer than the foot. Toes moderate, the tips dilated into small but very distinct discs, $\frac{1}{3}$ to $\frac{1}{2}$ webbed, 3 phalanges of fourth free; subarticular tubercles moderate; a feeble tarsal fold; inner metatarsal tubercle feebly prominent, $\frac{3}{8}$ to $\frac{3}{5}$ the length of the inner toe; no outer tubercle.

Skin smooth or with small warts or feeble corrugations; a strong fold from the eye to the shoulder.

Rich yellow to orange brown above, in life, with dark brown spots, with or without a light vertebral streak; a dark brown cross-band between the eyes, edged with pale yellow in front, usually followed by a faint **W**-shaped marking, the ends of which extend behind the eyes; sides of body finely spotted with very dark brown and white; lips with more or less distinct dark vertical bars; limbs with dark cross-bands. Lower parts white, with pale purple and golden shades, with or without dark brown spots on the throat.

Males without vocal sacs.

Nasal bones large and in contact with each other and with the frontoparietals; ethmoid covered over; zygomatic branch of squamosal long, extending to the eye.

Eggs very large and few, unpigmented, 3 millim. in diameter, in a female measuring 35 millim. from snout to vent.

Measurements in millimetres.

		1.	2.	3.	4.	5.	6.
		♀	♀	♀	♂	♀	♀
From snout to vent	..	24	37	24	25	35	27
Head	..	9	14	9	10	12	10
Width of head	..	9	16	9	10	13	10
Snout	..	3	5	3	3.5	4.5	3.5
Eye	..	3	5	3	3.5	4.5	3.5
Interorbital width	..	2	3	2	2.5	2.5	2
Tympanum	..	1.5	2.5	2	2	2.5	2.5
Fore limb	..	13	22	14	16	19	16
Hind limb	..	38	62	45	49	57	46
Tibia	..	12	20	14	16	18	15
Foot	..	12	20	14	15	7	15

1. Penang. 2. Larut hills, Perak. 3. Gunong Inas, Pahang. 4—5. Great Natuna. 6. Andamans (*R. gracilis*, var. *andamanensis*, Stol.).

Habitat. Higher forests of Penang, mountains of Malay Peninsula (Perak and between Perak and Kedah), Andamans,¹ Natuna Islands.

¹ One of the types of *R. gracilis* v. *andamanensis*, received from the Indian Museum in 1893, belongs to this species, whilst the others are stated by Annandale to be referable to *R. doriae* and *R. limnocharis*.

20. *Rana limborgii*.

Rana limborgii, W. Sclater, *Proc. Zool. Soc.* 1892, p. 344, pl. xxiv, fig. 3 ; Bouleng., *Ann. Mus. Genova* (2) XIII, 1893, p. 329, pl. x, fig. 1 ; Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1916, p. 165.

Vomerine teeth in oblique oval groups just behind the level of the choanae. Bony prominences in front of lower jaw barely indicated in females, rather large and pointed in males.

Head moderate, moderately depressed, as long as broad or a little broader than long, larger in males than in females ; snout rounded, scarcely projecting beyond the mouth, as long as the eye ; canthus rostralis obtuse ; loreal region moderately oblique, slightly concave ; nostril equidistant from the eye and the tip of the snout or a little nearer the latter ; the distance between the nostrils equal to or greater than the interorbital width, which equals or exceeds that of the upper eyelid ; tympanum distinct, $\frac{3}{8}$ to $\frac{1}{2}$ the diameter of the eye and $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers rather short, the tips dilated into small discs, first as long as or slightly longer than the second, third as long as or slightly shorter than the snout ; subarticular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the tip of the snout, or a little beyond, the heels overlapping when the limbs are folded at right angles to the body ; tibia $3\frac{1}{3}$ to 4 times as long as broad, $1\frac{1}{3}$ to 2 times in length of head and body, a little shorter or a little longer than the fore limb, as long as or a little longer than the foot. Toes rather short, the tips dilated into small but very distinct discs, $\frac{1}{3}$ to $\frac{1}{2}$ webbed, 3 phalanges of fourth free ; subarticular tubercles moderate ; a mere trace of a tarsal fold ; inner metatarsal tubercle large, very prominent, compressed, blunt-edged, $\frac{3}{8}$ to $\frac{1}{2}$ the length of the inner toe ; no outer tubercle.

Skin smooth, usually with more or less distinct traces of a narrow glandular dorso-lateral fold beginning behind the upper eyelid ; a strong fold from the eye to the shoulder.

Pale brown above, with small darker spots ; upper surface of snout sometimes pale greyish or yellowish ; a dark cross-bar between the eyes and often a **A**-shaped marking between the shoulders ; a blackish streak on each side of the head, passing through the eye ; lips with dark brown vertical bars ; a yellowish vertebral stripe sometimes present ; limbs with more or less regular dark cross-bands. Lower parts white, throat sometimes spotted or speckled with brown.

Males with internal vocal sacs, which may be indicated externally by strong folds on each side of the throat.

Nasal bones large and in contact with each other and with the frontoparietals ; ethmoid covered over ; zygomatic branch of squamosal long, extending to the eye.

Eggs very large and few, unpigmented, the vitalline sphere 3 millim. in diameter in a female measuring 32 millim. from snout to vent.

Measurements in millimetres.

	1.	2.	3.	4.	5.
	♂	♂	♀	♀	♀
From snout to vent	33	32	31	32	26
Head	13	12	11	11	10
Width of head	14	13	11	11	10
Snout	4.5	4.5	4	4	3.5
Eye	4.5	4.5	4	4	3.5
Interorbital width	3.5	3	2.5	2.5	2
Tympanum	3	3.5	2	2.5	2
Fore limb	19	18	17	18	15
First finger	3.5	3.5	3	3.5	2.5
Second finger	3	3	3	3	2.5
Third finger	4	4	4	4	3
Fourth finger	2.5	2.5	2.5	2.5	2
Hind limb	53	51	59	52	43
Tibia	17	16	19	17	14
Foot	16	16	18	16	14
Third toe	8	8	10	8	7
Fourth toe	13	12	14	12	10
Fifth toe	8	8	9	8	6

1—2. N. of Utradit, N. Siam. 3. Nakon si Tamarat, Siam. 4. Karin Bia-po, Upper Burma. 5. Tenasserim.

Habitat. Tenasserim, Upper Burma, Siam.

Very closely allied to *R. hascheana*, from which it is distinguished by the larger and more prominent inner metatarsal tubercle and by the presence of tooth-like prominences in front of the lower jaw as well as of vocal sacs in the males.

21. *Rana microdisca*.

Rana microdisca, Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 137; F. Müll., *Verh. Nat. Ges. Basel*, X, 1894, p. 839; Boettg. in Semon, *Zool. Forsch. Austral.* V, p. 113, pl. v. fig. 2 (1894); Bouleng., *Ann. Mus. Genova* (2) XIV, 1894, p. 616, *Proc. Zool. Soc.* 1897, p. 230, and *Ann. and Mag. N.H.* (6) XIX, 1897, p. 508; Van Kampen, *Zool. Jahrb., Syst.* XXII, 1905, p. 702.

Rana leyntensis, Boettg., *Zool. Anz.* 1893, p. 365; Bouleng., *Proc. Zool. Soc.*, 1897, p. 229.

Vomerine teeth in moderately long or rather short, strong, oblique series originating between the choanae and extending beyond the level of their posterior borders, or entirely behind them. Bony prominences in front of lower jaw barely indicated in females, rather small and pointed in males.

Head moderate, moderately depressed, as long as broad or a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately or feebly oblique, concave; nostril equidistant from the eye and from the end of the snout or a little nearer the latter; the distance between the nostrils equal to or greater than the interorbital width, which is equal to or less than that of the upper eyelid; tympanum distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye and $1\frac{1}{2}$ to 3 times its distance from the latter.

Fingers moderate, the tips swollen or dilated into very small discs, first as long as or a little longer than the second, third as long as or a little longer than the snout; subarticular tubercles moderate.

Hind limb long or very long, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or considerably beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $4\frac{1}{2}$ to 5 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, as long as or shorter than the fore limb, a little longer than the foot. Toes moderately long, the tips dilated into small but very distinct discs, $\frac{3}{4}$ to $\frac{2}{3}$ webbed, 2 or 3 phalanges of fourth free; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle moderately or feebly prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Upper parts with small warts which may form interrupted longitudinal folds; a dorso-lateral fold, beginning behind the upper eyelid, if present, not extending beyond the scapular region; a glandular fold from the eye to the shoulder. Lower parts smooth.

Coloration very variable. Brown or olive above, with darker spots on the back and a dark bar between the eyes, sometimes with a yellowish cross-bar in front of it; upper surface of snout sometimes entirely yellowish; lips with dark vertical bars; two yellowish dorsal stripes, or a yellowish vertebral stripe, sometimes present; limbs with dark cross-hands. Yellowish white beneath, throat and breast often spotted, marbled, or mottled with brown.

Males without vocal sacs.

Nasal bones moderately large, separated on the median line; a small portion of the ethmoid uncovered; zygomatic branch of squamosal moderately long. Omosternum forked at the base.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	♂	♂	♂	♀	♀	♂	♀	♂	♀	♀
From snout to vent ..	50	48	44	56	43	29	29	34	36	42
Head ..	17	17	16	19	16	11	11	13	14	15
Width of head ..	20	18	18	21	17	11	11	13	14	15
Snout ..	7	6.5	6	6	6	4	4	4.5	5	5
Eye ..	7	6.5	6	7	6	4	4	4.5	5	5
Interorbital width ..	4	3.5	3	3.5	2.5	2.5	2.5	3	3	3
Tympanum ..	3.5	3.5	3.5	4	3.5	2.5	2	2.5	3	3
Fore limb ..	35	30	30	33	28	19	19	23	21	25
First finger ..	7	6	6	7	5	4	4	5.5	5.5	5.5
Second finger ..	6	5.5	5	5.5	4.5	4	4	5	4.5	5
Third finger ..	8	7	7	8	6	5	5	6.5	6	6.5
Fourth finger ..	5	5	5	5.5	4	3.5	3.5	4.5	3.5	4
Hind limb ..	101	89	84	94	91	50	52	58	62	78
Tibia ..	31	30	27	30	29	16	17	20	21	27
Foot ..	30	26	25	28	27	15	16	17	18	25
Third toe ..	16	13	13	14	12	8	8	10	10	12
Fourth toe ..	26	21	20	20	22	12	13	14	15	20
Fifth toe ..	16	14	14	14	14	8	8	9	9	14

1—4. Flores. 5. Tomohon, Celebes. 6—7. S. Celebes. 8. Tawi-Tawi, Sooloo Ids. 9. Sandakan, N. Borneo. 10. Tjibodas, Java, 4700—6500 ft. (*Ind. Mus.*).

Habitat. Originally described from the mountains of Java, this small frog has since been found in the Philippines (*R. leytensis*), in Borneo, Sumatra, Mentawi, the Sooloo Islands, Celebes and Flores.

22. *Rana palavanensis.*

Rana palavanensis, Bouleng., *Ann. and Mag. N.H.* (6) XIV. 1894, p. 85.
and *Proc. Zool. Soc.*, 1897, p. 230.

Vomerine teeth in short oblique series just behind the level of the choanae. Bony prominences in front of lower jaw absent.

Head moderate, moderately depressed, as long as broad, or slightly broader than long; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately oblique, slightly concave; nostril equidistant from the eye and from the end of the snout; the distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum distinct, $\frac{1}{2}$ to $\frac{2}{3}$ the diameter of the eye, $1\frac{1}{2}$ to $1\frac{1}{2}$ times its distance from the latter.

Fingers moderate, the tips swollen or dilated into very small discs, first as long as or slightly longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad $1\frac{2}{3}$ to $1\frac{10}{11}$ times in length from snout to vent, as long as or slightly longer or slightly shorter than the fore limb, as long as or longer than the foot. Toes moderate, the tips dilated into small but very distinct discs, $\frac{2}{3}$ webbed, 2 or 3 phalanges of fourth free; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle elliptical, flat, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin nearly smooth; posterior half of upper eyelids warty; a glandular fold from the eye to the shoulder; a narrow glandular dorso-lateral fold, beginning behind the upper eyelid.

Brown or greyish-brown above; sides of snout below the canthi blackish or dark grey, with some more or less distinct dark vertical bars on the lip; supratemporal and dorso-lateral folds edged with dark brown or black on the outer side; a dark cross-bar between the eyes and a dark A-shaped interscapular marking usually present; limbs with regular dark cross-bands. Lower parts whitish, uniform, or throat and breast spotted with brown.

Males with internal vocal sacs.

Nasal bones moderately large, separated on the median line; a small portion of the ethmoid uncovered; zygomatic branch of squamosal moderately long.

Eggs large, 8 millims. in diameter in female 36 millim. long from snout to vent.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	♀	♀	♀	♀	♀	♀	♂	♂	♀	♂
From snout to vent	.. 33	33	31	35	35	36	38	40	42	33
Head ..	.. 12	12	11	13	13	13	15	16	15	13
Width of head ..	.. 12	12	11	14	14	14	15	16	15	13
Snout ..	.. 4	4	4	4.5	4.5	4.5	5	5	5	4.5

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	♀	♀	♀	♀	♀	♀	♂	♂	♀	♂
Eye	4	4	4	4.5	4.5	5	5	5	4.5
Interorbital width	3	3	3	3	3.5	4	3	3	2.5
Tympanum	2.5	2.5	2.5	2.5	2.5	3	2.5	2.5	3
Fore limb	20	20	20	20	21	21	23	24	23
First finger	3.5	4	3.5	4	5	5	5	5	4
Second finger	3.5	3.5	3.5	4	4.5	5	5	4.5	3.5
Third finger	5	5	5	5	5.5	6	6	7	6
Fourth finger	3	3	3	3.5	3.5	3.5	5	4	3.5
Hind limb	58	58	60	61	64	67	75	67	68
Tibia	20	20	21	21	22	22	24	22	22
Foot	17	17	17	18	19	20	22	21	20
Third toe	9	9	9	10	11	11	12	11	10
Fourth toe	13	13	12	14	14	15	17	16	16
Fifth toe	8	9	9	9	10	10	11	11	9

1—3. Palawan (type). 4. Matang, Sarawak. 5. Penrissen Mt., Sarawak. 6. Kina Baloo, N. Borneo. 7. Loka, Celebes. 8. Matinang, Celebes. 9. Rurukan, Celebes. 10. Tasosso, Celebes, 4000 f.

Habitat. Palawan, Borneo, Celebes.

23. *Rana narina*.

Rana narina, Stejneger, *Proc. Biol. Soc. Washington*, XVI, 1901, p. 189 and *Herp. Jap.* p. 134, fig. (1907).

Vomerine teeth in nearly transverse series on a level with the posterior borders of the choanae, a little nearer to each other than to the latter.

Head slightly longer than broad; snout nearly squarish, vertically truncate; canthus rostralis distinct; loreal region subvertical, very concave; nostrils close to the end of the snout; interorbital region narrower than the upper eyelid; tympanum very distinct, $\frac{1}{2}$ the diameter of the eye, only a little longer than its distance from the latter.

Fingers rather long, first longer than the second, terminating in very small discs; subarticular tubercles large.

Tibio-tarsal articulation extending considerably beyond the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia $1\frac{3}{4}$ times in length from snout to vent, shorter than the fore limb, much shorter than the foot. Toes nearly entirely webbed, terminating in very small discs; outer metatarsals separated nearly to the base; subarticular tubercles strong; no tarsal fold; inner metatarsal tubercle but slightly prominent, about $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth.

Brownish above; a narrow whitish line from under the eye to behind the commissure of the jaws; sides and posterior surface of the thighs coarsely marbled with dark brown. Whitish beneath, chin and throat clouded with dusky.

From snout to vent 66 millim.

Habitat. Loo Choo Islands (Okinawa Shima).

The single species is preserved in the Science Collection, Tokyo.

The position of this species is doubtful, but there seems to be no better place for it than not far from *R. doriae* and *R. microdisca*.

24. *Rana corrugata*.

Rana kuhlii, part., Günth., *Cat. Batr. Sal.* p. 7 (1858), and *Rept. Brit. Ind.* p. 404, pl. xxvi, fig. B (1864).

Rana corrugata, Peters, *Mon. Berl. Ac.*, 1863, p. 412; Bouleng., *Cat. Batr. Écaud.* p. 19 (1882). *Ann. and Mag. N.H.* (5) XIV, 1884, p. 587, and *Faun. Ind.*, *Rept.* p. 443 (1890); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 149, fig.

Vomerine teeth in small oblique groups close together behind the level of the choanae. Lower jaw with two acutely pointed tooth-like prominences in front, strongly developed and fitting into pits in the upper jaw in adult males.

Form stout, toad-like. Head broader than long, much depressed; snout rounded, not projecting, as long as or a little shorter than the eye; no canthus rostralis; loreal region oblique, not concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils equals the interorbital width, which exceeds the very narrow upper eyelid, the eye being obliquely directed upwards; tympanum hidden, distant from the eye and about $\frac{3}{4}$ its diameter.

Fingers rather short, obtuse, without dermal margin, first usually a little shorter than the second, third longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb short and thick; tibio-tarsal articulation reaching the temple or the posterior border of the eye; heels separated when the limbs are folded at right angles to the body; tibia 2 to $2\frac{1}{2}$ times as long as broad, $2\frac{1}{3}$ to $2\frac{1}{2}$ times in length from snout to vent, as long as the foot, much shorter than the fore limb. Toes short, fully and broadly webbed, terminating in rather large round discs; subarticular tubercles rather small, moderately prominent; a narrow fold along the inner side of the first toe and of the tarsus, interrupted by the feebly prominent, narrow inner metatarsal tubercle, which measures about $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Upper parts with very crowded linear rugosities, which form transverse folds on the body; round warts on the upper eyelids; a feeble fold from the eye to the shoulder; lower parts smooth.

Brown above, uniform or with darker spots; a yellow, dark-edged cross-bar between the eyes, and another below the dark temporal fold; a yellow vertebral streak sometimes present; lower parts white, throat sometimes spotted with brown.

Males without secondary sexual characters except the greater development of the tooth-like processes of the lower jaw.

Skeleton as in *R. kuhlii*.

The tadpole has been described and figured by Annandale. Tail only about $1\frac{1}{2}$ times as long as head and body. Beak extremely massive and prominent, entirely black; a large papillose lobe on each side of the mouth; only a single, long, marginal series

of upper labial teeth, and two, uninterrupted, long series of lower labials.

Measurements in millimetres.

			1. ♂	2. ♂	3. ♂	4. ♀
From snout to vent	..	..	65	40	52	54
Head ..	..	..	22	14	19	19
Width of head	..	..	25	16	21	21
Snout ..	..	..	5	4	5	5
Eye ..	..	..	7	5	5	6
Interorbital width	..	..	4	3	3.5	3
Fore limb	..	..	35	21	30	29
First finger	..	..	6	4.5	5	5.5
Second finger	..	..	7	4.5	6	6
Third finger	..	..	8	5.5	8	7.5
Fourth finger	..	..	6	3.5	5.5	5.5
Hind limb	..	..	82	54	72	74
Tibia ..	..	..	26	17	21	22
Foot ..	..	..	26	17	22	22
Third toe	..	..	15	9	12	14
Fourth toe	..	..	21	15	19	19
Fifth toe	..	..	15	10	14	14

1. Punduloya, 4000 f. 2. S. Ceylon. 3—4. Ceylon.

Habitat. Ceylon.

25. *Rana kuhlii*.

? *Houlema obscura*, Gray, *Zool. Misc.* p. 38 (1831).

Rana kuhlii, Dum. and Bibr., *Exp. Gén.* VIII, p. 384 (1841); Anders, *Anat. Zool. Res. Yunn.* p. 838 (1879); Bouleng., *Ann. Mus. Genova* (2) V, 1887, p. 482, *Faun. Ind., Rept.* p. 443 (1890), *Ann. and Mag. N.H.* (6) VII, 1891, p. 344, and *Proc. Zool. Soc.* 1899, p. 166; S. Flow., *Proc. Zool. Soc.* 1899, p. 887; Bouleng., *Ann. and Mag. N.H.* (8) IV, 1909, p. 495, and *Faun. Mal. Pen., Rept.* p. 229 (1912); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 147; Malcolm Smith, *Journ. N.H., Soc. Siam*, II, 1917, p. 262, pl. — fig. 1.

Rana kuhlii, part., Günth., *Cat. Batr. Sal.* p. 8 (1858), and *Rept. Brit. Ind.* 404 (1864); Bouleng., *Cat. Batr. Ecaud.* p. 20 (1882).

Rana conspicillata, Günth., *Proc. Zool. Soc.* 1872, p. 597, pl. xl, fig. A. *Nyctibatrachus sinensis*, Peters, *Sitzb. Ges. Naturf. Fr. Berl.* 1882, p. 146.

Rana paradoxa (non L.) Mocquard, *Le Natur.* 1890, p. 155, *N. Arch. Mus* (3) II, 1890, p. 148, pl. x, fig. 3, and *Mém. Soc. Zool. France*, 1892, p. 198.

Rana namiyei, Stejneger, *Proc. Biol. Soc. Washington* XIV, 1901, p. 190, and *Herp. Japan*, p. 136, fig. (1907); Van Denburgh, *Proc. Calif. Acad.* (4) III, 1909, p. 55 and 1912, p. 194; Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 145.

Vomerine teeth in oblique series just behind the level of the choanae. Lower jaw with two tooth-like prominences in front, feebly developed in females, large, obtuse and fitting into deep pits in the upper jaw in adult males.

Head larger in males than in females, much depressed, the occipital region more convex in males, broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or slightly longer or slightly shorter than the eye; no canthus rostralis; loreal region oblique, slightly concave; eye.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.
	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀	♂	♂	♂	♂	♂	♂	♀	♀	♀	♂	♀	♂	♀
From snout to vent	..	50	52	76	67	65	53	58	60	51	53	61	55	60	54	75	62	52	48	62	55	54	61
Head	..	18	20	27	22	20	21	18	23	21	17	22	23	22	20	24	21	18	15	24	19	21	21
Width of head	..	21	24	32	26	24	24	20	25	25	21	26	26	26	23	30	24	20	18	28	21	23	23
Snout	..	6	7	9	8	7	7	6	7	6	5	6	7	6	6	8	7	6	5	7	6	6.5	6
Eye	..	6	7	8	8	7	7	6	7	7	6	6	7	6	6	8	7	6	5	8	6	6.5	7
Interorbital width	..	3	4	7	4	4	4	3.5	5	3.5	3	5	5	5	4	5	4	3	3	4	3	3	3
Pore limb	..	31	29	42	38	36	37	30	33	34	31	32	36	33	29	45	33	28	26	36	31	30	35
First finger	..	6.5	6	9	8	8	9	7	7	8	7	7	8	8	7	9	7.5	7	6	6	7	7	7.5
Second finger	..	6.5	5.5	8	7	7	7	6	6	7	7	7	7	7.5	7	6	8	6.5	6	6	6	8	8
Third finger	..	8	7	10	9	9	10	7.5	9	9	8	8	9	9	9	8	12	8.5	7.5	7	9	8	8
Fourth finger	..	5.5	6	7	6.5	6.5	7	5.5	5	6	5.5	6	6	6	5	8	6	5	5	6	7	6	5
Hind limb	..	76	75	110	97	97	94	75	86	79	76	83	90	81	89	78	115	81	73	67	83	77	82
Tibia	..	23	24	34	31	30	30	23	26	25	24	26	28	25	28	24	37	26	23	21	26	24	26
Foot	..	23	24	34	31	31	30	23	28	25	24	26	28	25	28	24	37	26	23	21	26	25	26
Third toe	..	12	13	16	14	14	15	12	13	11	11	12	15	14	15	13	17	14	12	11	13	14	12
Fourth toe	..	18	19	26	24	25	24	19	21	21	18	20	22	20	22	19	28	20	18	16	20	20	21
Fifth toe	..	13	14	20	18	18	17	14	15	15	14	17	15	17	14	20	15	13	12	14	14	14	14
First toe	..	7	7	9	8	8	7.5	6	7.5	7	7	7.5	7	8	7	9	7	6.5	6	6	7	6	7
Inner metatarsal tubercle	..	3	3.5	5.5	5	4.5	5	3	3.5	3	3.5	4	4.5	4	3	3.5	5	3.5	3	3	4	3	4

1. Java. 2. Celebes. 3-7. Matang, Borneo (types of *R. conspiciatula*). 8. Penritsen Mt., Sarawak. 9-10. Lawas, Brunei. 11. Gunong Kalawai, N. Borneo. 12-13. Bongon, N. Borneo. 14-18. Kina Balu, N. Borneo. 19. Kina Balu (type of *R. paradoxo*). 20. Siolak Daras, Korinchi, Sumatra. 21. Sungai Kumbang, Korinchi, Sumatra. 22-23. Serenu, Mentawai.

From snout to vent	..	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.	37.	38.	39.	40.	41.	42.	43.
Head	..	..	81	44	82	87	57	73	65	72	58	47	60	56	54	51	62	56	52	61	53
Width of head	..	..	27	17	31	32	21	32	22	22	16	20	22	21	17	17	23	21	20	24	22
Snout	..	..	32	20	35	42	25	37	25	25	19	24	25	25	20	19	29	26	23	27	25
Eye	..	..	9	5	9	9	6	9	8	7	5	7	7	6	6	6	7	6	6	7	6
Interorbital width	..	..	5	3	5	5	6	4	5	3	4	2	5	4	4	3	5	4	4	4	3
Fore limb	..	..	51	27	44	47	29	41	32	32	25	29	31	29	25	22	32	30	28	31	27
First finger	..	..	10	5	9	9	7	8	7	5	4	6	5	5	4	4	5	4	5	6	5
Second finger	..	..	9	5	8	9	6	8	6	5	5	4	5	5	4	4	5	4	5	6	5
Third finger	..	..	12	7	10	10	8	10	8	6	5	6	7	6	5	6	5	8	7	7	7
Fourth finger	..	..	9	4	7	6	6	7	6	4	5	4	6	4	3	5	4	4	4	5	4
Hind limb	..	..	119	69	115	112	77	100	84	84	68	75	80	77	74	68	81	75	70	80	79
Tibia	..	..	36	22	34	36	23	31	26	26	22	24	25	23	23	21	26	25	23	25	24
Foot	..	..	40	22	36	37	25	32	26	26	22	24	25	23	24	21	28	25	23	26	25
Third toe	..	..	20	10	19	19	14	15	14	14	10	13	12	12	12	11	14	12	11	14	12
Fourth toe	..	..	32	16	28	29	19	26	22	20	18	19	19	18	18	15	21	19	18	21	20
Fifth toe	..	..	24	11	22	21	14	18	15	15	12	14	12	11	12	11	14	12	12	14	13
First toe	..	..	11	5	10	11	7	8	6	7	6	7	6	5	5	6	6	5	6	6	6
Inner metatarsal tubercle	..	..	5	3	5	4	3	4	3	5	3	5	3	3	3	2	5	4	3	5	3

24--25. Gunong Tahan, Pahang. 26. Larut hills, Perak. 27--28. Plapoo, Tenasserim. 29--30. Tenasserim. 31. Man Son Mts., Tonkin.
 32--33. Foosee, Yunnan. 34--37. Kuatun, Fokien. 38--40. Fuhosho, Formosa. 41. Alikang, Formosa. 42--43. Kaushire, Formosa.

obliquely directed upwards, the upper eyelid often very narrow; nostril a little nearer the end of the snout than the eye; the distance between the nostrils not or but little greater than the interorbital width, which usually nearly equals or (in large males) exceeds that of the upper eyelid; tympanum usually hidden, rarely slightly distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye and widely separated from the latter.

Fingers short or moderate, obtuse or slightly swollen at the end, first and second equal or first the longer, third as long as or longer than the snout, second and third often with a dermal fold on each side; subarticular tubercles large, moderately prominent.

Hind limb short or rather short, the tibio-tarsal articulation reaching the temple or the eye, the heels meeting or failing to meet, when the limbs are folded at right angles to the body; tibia $2\frac{1}{2}$ to 3 times as long as broad, 2 to $2\frac{1}{2}$ times in length from snout to vent, as long as or a little shorter than the foot, shorter than the fore limb. Toes short or rather short, the tips dilated into small but very distinct discs, fully webbed or the web strongly emarginate and not reaching beyond the penultimate phalanx of the fourth; subarticular tubercles rather large, moderately prominent; a narrow tarsal fold; inner metatarsal tubercle narrow, moderately prominent, $\frac{2}{3}$ to $\frac{3}{4}$ the length of the inner toe; no outer tubercle.

Skin smooth above, except on the calves and on the posterior part of the upper eyelids, which are nearly always warty, or with short longitudinal glandular folds or roundish tubercles; a glandular fold from the eye to the shoulder; sometimes a distinct fold across the head, behind the eyes. Lower parts smooth.

Brown above, uniform or with small darker spots on the back and more or less irregular cross-bars on the limbs; usually a dark bar, light-edged in front, between the eyes, and dark vertical bars on the lips; a dark canthal and temporal streak often present; a yellow vertebral streak rarely present (specimens from Matang, Bongo, Kina Balu, and Kuatun). Lower parts white, throat and breast often mottled with brown, sides of belly and lower surface of legs sometimes speckled with brown.

Males without vocal sacs, the fore limbs neither thickened nor bearing nuptial excrescences; differing from the female by the larger, often much larger, head, which may be more triangular in shape, and by the larger bony prominences in front of the lower jaw.

Nasals large, in contact with each other and with the frontoparietals, which cover the ethmoid; zygomatic branch of squamosal very long, curved, reaching the lower border of the eye. Omosternal style slender, forked at the base; sternal style short. Terminal phalanges transversely expanded at the end.

The vitellus of eggs ready to be laid measures 2 millim. in diameter, the mother measuring 51 millim. from snout to vent.

Tadpoles from Hong Kong Peak, referred by Annandale to *R. kuhlii*, and said to resemble those of *R. macrodon*, have since

(*Rec. Ind. Mus.*, XIV, 1918, p. 68) been regarded as incorrectly identified.

Siamese tadpoles, described by Malcolm Smith, on the correct identification of which there can be no doubt, have the beak broadly edged with black; upper lip with a long, continuous row of teeth, followed by a second, broadly interrupted; lower lip with three continuous rows of teeth, or the innermost narrowly interrupted. Body considerably flattened; tail nearly twice as long as the body, 4 times as long as deep, tip bluntly pointed, crests rather low, upper a little deeper than lower, not extending on to the back. Olive above, speckled with blackish.

Habitat. Southern China, Loo Choo Islands and Formosa to the Malay Peninsula and Archipelago (Sumatra, Borneo, Java, Celebes).

This species varies much individually, but I am unable to find characters by which to define geographical races. Full-grown males (105 millim. from snout to vent) from Tenasserim have an enormously large head, nearly as long as and broader than the body; the head is also remarkably large in some adult males from Borneo (*R. paradoxa*, Mocquard), the Loo Choo Islands (*R. namiyei*, Stejneger), and Formosa. Such males have also a very broad interorbital region, broader than the upper eyelid, and thus contrast very strikingly with females from the same localities, in which the head is not larger in proportion than in *R. limnocharis*, and the interorbital region may be even narrower than the upper eyelid. The toes are usually webbed to the terminal discs, except in the specimens from Kuatun and Formosa, and in some from Borneo, in which the last phalanx of the fourth is free, or very narrowly bordered, the web being more strongly emarginate; but other specimens are intermediate. The fingers vary in length, being very short in the specimens from Kuatun and Formosa; but here again the difference is bridged over by specimens from other localities, as may be seen from the table of measurements.

The following 'species' is doubtfully distinct from *R. kuhlii* and I should have been inclined to regard it as identical but for the disposition ascribed to the vomerine teeth.

Rana khasiana.

Pyxicephalus khasiensis, Anders., *Journ. As. Soc. Beng.* XL, 1871, p. 23.
Rana khasiana, Bouleng., *Cat. Batr. Ecaud.* p. 34 (1882).

"Body short and thick, legs of moderate length. Head short and broad. Snout short and rounded; no canthus rostralis; nostrils directed upwards and backwards, almost on the upper surface and halfway between the eye and the snout. Eyes rather large and prominent. Occiput much swollen. Tympanum invested by the skin, but faintly visible, small, one half the diameter of the eye. Skin in the groin full, smooth throughout, no trace of tubercles; fingers quite free; three small tubercles on the palmar aspect, the inner one the largest, elongated and simulating the shovel-like

tubercle of the metatarsus. The first and second fingers of nearly equal length, about half shorter than the third; the fourth about one-third shorter than the third. Thigh rather short, lower leg little shorter than the thigh. Tarsus and foot the length of the thigh and one half of the tibial portion. The body very little longer than the distance between the vent and the heel. The shovel-shaped (metatarsal) prominence laterally compressed, but not prominent. Two apophyses on the lower jaw. The choanae are round, more distinctly defined, but rather smaller, than the eustachian tubes; vomerine prominences placed transversely behind the choanae and separated from each other by a narrow interval. Tongue rather small, cordate and notched behind. Uniform brown above, faintly barred on the thighs; spotted with brown on the sides, chin, thorax, and under surface of limbs."

Habitat. Khasi Hills.

26. *Rana laticeps*.

Rana laticeps, Bouleng., *Cat. Batr. Ecaud.* p. 20, pl. i, fig. 1 (1882), and *Faun. Ind., Rept.* p. 444 (1890); S. Flower, *Proc. Zool. Soc.* 1896, p. 897; Bouleng., *Faun. Mal. Pen., Rept.* p. 230 (1912).

Vomerine teeth in strong oblique groups or series just behind the level of the choanae. Lower jaw with two bony prominences in front, feebly developed in females, large, acute and directed backwards in adult males.

Head larger in males than in females, much depressed, broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis obtuse; loreal region more or less oblique, slightly concave; nostril a little nearer the end of the snout than the eye; the distance between the nostrils not or but little greater than the interorbital width, which equals or exceeds that of the upper eyelid; tympanum feebly distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye and 1 to $1\frac{1}{2}$ times its distance from the latter.

Fingers moderate, obtuse or slightly swollen at the end, first and second equal or first slightly the longer, third longer than the snout; subarticular tubercles moderate, moderately prominent.

Hind limb rather long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad, $1\frac{2}{3}$ to 2 times in length from snout to vent, as long as or slightly longer than the foot, a little shorter than the fore limb. Toes with the tips dilated into small discs, $\frac{2}{3}$ to $\frac{3}{4}$ webbed, the last or last two phalanges on the fourth free (narrowly bordered); subarticular tubercles moderate, moderately prominent; a narrow tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{1}{4}$ to $\frac{3}{8}$ the length of the inner toe; no outer tubercle.

Skin often corrugated above, with small elongate warts and rounded tubercles; a fold above the tympanum; lower parts smooth, throat sometimes corrugated.

Brown above, indistinctly marbled with darker; a dark bar, light edged in front, between the eyes; usually a dark and light chevron-shaped band on the anterior part of the back; a more or less distinct dark canthal and temporal streak and dark vertical bars on the lips; limbs with more or less distinct dark cross-bars. Lower parts white, throat often spotted with brown.

Males without vocal sacs, distinguished by a larger head and stronger tooth-like prominences in the lower jaw.

Skull as in *R. kuhlii*.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.
	♂	♀	♀	♀	♀	♀	♂	♂
From snout to vent ..	47	41	36	35	34	35	51	29
Head ..	19	15	13	13	13	13	20	12
Width of head ..	22	17	15	15	15	15	24	14
Snout ..	5	4	4	4	4	4	6	4
Eye ..	5	5	4	4	4	4	6	4
Interorbital width ..	5	3.5	3	3	3	3	5	3
Tympanum ..	3.5	3	2.5	2.5	2.5	2.5	3.5	2.5
Fore limb ..	28	25	22	22	21	20	31	19
First finger ..	5	4.5	4.5	4	4	4	7	3.5
Second finger ..	5	4.5	4.5	4	4	4	6.5	3.5
Third finger ..	7	6	5.5	5.5	5	5	8	4.5
Fourth finger ..	4	3.5	3.5	4	4	3.5	6	3
Hind limb ..	70	69	59	60	60	58	80	50
Tibia ..	24	22	20	20	19	18	28	16
Foot ..	22	21	19	19	19	18	26	16
Third toe ..	12	10	9	9	9	10	12	8
Fourth toe ..	17	16	14	14	14	14	18	12
Fifth toe ..	11	10	8	8	9	10	12	8

1—5. Khasi hills (types). 6. Bengal, type. 7. Malacca. 8. Gunong Kledong, Perak.

Habitat. Bengal, Khasi hills, and Malay Peninsula.

27. *Rana feae*.

Rana feae, Boulenger, *Ann. Mus. Genova* (2) V, 1887, p. 418, pl. iii, and *Faun. Ind., Rept.* p. 446 (1890).

Vomerine teeth in small oblique groups between the choanae and extending beyond the level of their posterior borders.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, shorter than the eye; no canthus rostralis; loreal region oblique, concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum distinct, $\frac{2}{3}$ the diameter of the eye, not more than its distance from the latter.

Fingers obtuse, first a little longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye; tibia twice in length from snout to vent. Toes rather short, with obtuse tips, entirely webbed; subarticular tubercles moderate; a narrow tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Sides of body warty, large elongate smooth warts being intermixed with small round ones; posterior part of upper eyelid warty; a glandular fold from the eye to the shoulder.

Olive brown above, with rather indistinct darker spots and a blackish, white-edged ocellus at the hip-joint; interrupted dark cross-bands on the limbs; lower parts dirty white.

Males with internal vocal sacs; arms extremely thickened; a patch of black spines on each side of the breast and others on the inner side of the first and second fingers.

From snout to vent 92 millim.

Described from a single specimen, from the Kakhien hills, Burma, forming part of the collection made by the late L. Fea for the Genoa Museum. A second specimen, from Hotha, Yunnan, is stated by Mr. W. Sclater to be preserved in the Indian Museum.

Distinguished from *R. liebighii* by the distinct tympanum, the longer inner finger, the shorter hind limb, the presence of a tarsal fold, and the absence of dorso-lateral folds.

28. *Rana yunnanensis*.

Rana yunnanensis, Anders., *Anat. Zool. Res. Yunnan*, p. 839, pl. lxxviii, fig. 2 (1879).

This species rests on Anderson's description and figure; the types, Dr. Annandale informs me, are not to be found in the Indian Museum, and are probably lost.

Anderson's description is here reproduced:—

"Head broader than long; the snout rounded and somewhat pointed; nostril nearer the snout than the eye; canthus rostralis feeble; tympanum visible, but indistinct, half the size of the eye; a glandular fold from the eye over the tympanum to the shoulder; vomerine teeth but little developed and in two short oblique ridges on the inner side of the choanae, convergent behind, but separated from each other by a wide interval. Openings of the internal nostrils small, round, those of the eustachian tubes very small. Tongue free, cordate, deeply notched. A feeble fold along the metatarsus and along the first toe enclosing a small but strong laterally compressed sharp-edged crescentic tubercle, a fold along the fifth toe. Fingers tapering, tips not enlarged; the first, second and fourth subequal in size, the third slightly longer than the second; a few minute horny spines on the upper surface of the thumb. Toes incompletely webbed, the membrane emarginate, reaching to the extremities of all the toes but the fourth; fourth toe one-third longer than the third. Upper surface densely covered with round warty tubercles, each surmounted by a small black horny granule. Smooth beneath. Uniform greenish olive-brown, with obscure dark bands from the orbit to the lip and on the upper surface of the limbs; under surface brownish-yellow, reticulately spotted with deep brown. From the vent to the metatarsal tubercle is rather more than the length of the body."

From snout to vent 73 millim.

Habitat. Hotha, Yunnan, altitude 5000 feet.

29 *Rana tibetana*.

Rana tibetana, Bouleng., *Ann. and Mag. N.H.* (8) XX, 1917, p. 414.

Vomerine teeth in small oblique groups between the choanae and extending a little beyond the level of their posterior borders.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region very oblique, concave; nostril nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum distinct, $\frac{3}{8}$ the diameter of the eye and twice its distance from the latter.

Fingers obtuse, first slightly longer than the second, third longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the anterior border of the eye, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ times as long as broad, twice in length from snout to vent, a little longer than the foot, a little shorter than the fore limb. Toes with the tips swollen into small discs, entirely webbed; subarticular tubercles moderately large, moderately prominent; a very distinct tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{2}{7}$ the length of the inner toe; no outer tubercle.

Upper parts rough with granules and numerous round or oval warts tipped with black horny spinules; a feeble fold across the head, behind the eyes; a strong glandular fold from the eye to the shoulder; lower parts smooth.

Brown above with numerous ill-defined dark spots on the back and cross-bars on the limbs, the larger warts lighter; a light cross-bar between the eyes; lips with dark vertical bars. Lower parts brownish, throat and limbs mottled with brown.

Male with internal vocal sacs; arms thick, breast with black horny spines; similar spines, but more crowded, on the inner metacarpal tubercle and on the upper surface of the two inner fingers.

Measurements in millimetres.

From snout to vent	..	..	..	..	♂
Head	..	..	..	..	18
Width of head	..	..	..	..	25
Snout	..	..	..	..	5
Eye	..	..	..	..	7
Interorbital width	..	..	..	..	3.5
Tympanum	..	..	..	..	4
Fore limb	..	..	..	..	33
First finger	..	..	..	..	6
Second finger	..	..	..	..	5.5
Third finger	..	..	..	..	9
Fourth finger	..	..	..	..	6
Hind limb	..	..	..	..	92
Tibia	..	..	..	..	30
Foot	..	..	..	..	28
Third toe	..	..	..	..	14
Fourth toe	..	..	..	..	20
Fifth toe	..	..	..	..	14

A single specimen from Yin tsin wan, Wassu State, Tibet, preserved in the British Museum.

Distinguished from *R. gammiei* by the distinct tympanum, the presence of a tarsal fold, the larger metatarsal tubercle, and the presence of vocal sacs; from *R. feae*, by the swollen tips of the toes and the distinct canthus rostralis; from *R. yunnanensis*, by the less prominent metatarsal tubercle.

30. *Rana sternosignata*.

Rana sternosignata, J. A. Murray, *Ann. and Mag. N.H.* (5) XVI, 1885, p. 120; Boulenger, *Faun. Ind., Rept.* p. 445, (1890); Annand., *Mem. As Soc. Beng.* VI, 1917, p. 139.

Vomerine teeth in small oblique groups between the choanae and extending a little beyond the level of their posterior borders

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, a little shorter than the eye; no canthus rostralis; loreal region very oblique, slightly concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum not very distinct, not quite half the diameter of the eye and equal to the distance from the latter.

Fingers obtuse, first as long as or a little shorter than the second; subarticular tubercles small, moderately prominent

Hind limb rather short, the tibio-tarsal articulation reaching the temple or the posterior border of the eye, the heels not overlapping when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent, as long as or a little shorter than the foot, shorter than the fore limb. Toes obtuse or very slightly swollen at the tips, entirely webbed; subarticular tubercles very small, moderately prominent; a feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Upper parts smooth or with small warts, which may be tipped with black horny spines; a feeble fold across the head, behind the eyes; a glandular fold from the eye to the shoulder; lower parts smooth.

Olive-brown above, uniform or freckled with darker; limbs without transverse bands. Lower parts whitish, mottled or marbled with dark brown, at least on the throat and limbs.

Males with internal vocal sacs, arms much thickened; breast with black horny spines; similar spines, but more crowded, on the inner metacarpal tubercle and on the upper surface of the two inner fingers.

Nasals large and in contact with each other and with the frontoparietals, which entirely cover the ethmoid; zygomatic branch of squamosal long and curved, extending to below the eye. Omosternal style entire.

The large tadpoles (up to 90 millim. long), from Quetta, 5700 ft., for which I am indebted to Dr. Annandale, are remarkable for the very strongly marked lines of sensory canals, which are black (preservation in formalin). Tail 2 to $2\frac{1}{2}$ times as long as body, 3 to $3\frac{1}{2}$ times as long as deep, obtusely pointed, the dorsal crest not extending on to the body. Nostrils much nearer the eyes than the tip of the snout. Lip moderately developed, bordered with rounded or conical papillae on the sides and below; a marginal series of upper labial horny teeth and 4 series on each side; 3 series of lower labial teeth, the innermost narrowly interrupted in the middle; back entirely black.

Measurements in millimetres.

			1.	2.	3.	4.
			♂	♂	♂	♂
From snout to vent	..	..	76	84	70	68
Head ..	..	..	24	27	23	22
Width of head	..	..	31	34	30	28
Snout ..	..	..	8	9	8	7
Eye ..	..	..	9	10	9	8
Interorbital width	..	..	3	4	3.5	3
Tympanum	..	..	3.5	4	3.5	3.5
Fore limb	..	..	42	47	41	38
First finger	..	..	7	8	6	7
Second finger	..	..	8	9	7	7
Third finger	..	..	10	12	8	10
Fourth finger	..	..	7	9	6	7
Hind limb	..	..	112	115	98	93
Tibia ..	..	..	34	37	32	29
Foot ..	..	..	36	37	33	30
Third toe	..	..	20	19	17	16
Fourth toe	..	..	27	28	24	23
Fifth toe	..	..	20	20	18	17

1. Muller, nr. Karachi, type. 2. Quetta, type. 3—4. Quetta.

Habitat. Sind, Baluchistan, Kashmir.

Distinguished from *R. feae* by the shorter hind limbs and the shorter first finger.

[Owing to the looseness of its skin and its peculiar coloration this frog has in life a very different appearance from its allies. The skin falls naturally into irregular folds and when the head is held in the natural position forms a prominent transverse wrinkle behind the eyes. The dorsal surface is dull clay-colour or olivaceous with conspicuous orange spots or blotches of variable size and number sparsely scattered on the back. The head is speckled with black in some individuals. The ventral surface is white with a black reticulation more or less well developed. The pupil of the eye is reduced to a narrow slit in normal circumstances and a transverse dark streak runs across the iris at both ends. A similar streak runs vertically downwards across the iris above and below the pupil, giving the whole eye a most peculiar appearance. This feature also occurs in the tadpole. The iris itself is golden brown.

R. sternosignata is extremely common, with *R. cyanophlyctis*, in pools and water-channels in the Quetta and Pishin districts of Baluchistan between 5000 and 6000 feet. Mr. Kemp and I did

not see it in the Nushki desert or in Seistan, where we could hardly have failed to observe it if it occurred.

R. sternosignata is the most completely aquatic Indian frog with which I am acquainted. It usually rests, at any rate in winter, on the bottom, sometimes in as much as ten feet of water, and rarely or never comes on dry land. Although somewhat sluggish in very cold weather it does not hibernate but remains exposed and alert even under ice. The secondary sexual characters of the male are well developed in winter. The tadpoles, which reach a very large size, as a rule spend the winter in the larval state, but few were observed in November that seemed to be about to undergo their final metamorphosis. N. A.]

31. *Rana phrynoides*.

Rana phrynoides, Boulenger, *Ann. and Mag. N.H.* (8) XX, 1917, p. 413.

Vomerine teeth in small oblique groups commencing on a line with and extending back beyond the level of the posterior borders of the choanae.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis indistinct; loreal region very oblique, slightly concave; nostril nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum hidden or very indistinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye.

Fingers obtuse, first longer than the second, third longer than the snout; subarticular tubercles small, moderately prominent.

Hind limb short, the tibio-tarsal articulation reaching the shoulder or the temple, the heels just meeting when the limbs are folded at right angles to the body; tibia $2\frac{1}{2}$ times as long as broad; $2\frac{1}{3}$ to $2\frac{1}{2}$ times in length from snout to vent, a little shorter than the foot, much shorter than the fore limb. Toes short, with obtuse tips, entirely webbed; subarticular tubercles small, moderately prominent; a feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Upper parts granulate, with numerous small warts on the back, some of which may be elongate; these granules and warts may bear black horny spinules; a strong fold across the head behind the eyes, and a very strong glandular fold from the eye to the shoulder; lower parts smooth.

Dark olive above, uniform or with rather indistinct darker spots; lips with or without dark vertical bars; dark cross-bars on the limbs very irregular, if present. Lower parts whitish, uniform, or throat and hind limbs spotted or marbled with blackish.

Males with internal vocal sacs; during the breeding-season the arms are remarkably thickened and black horny spines form two patches on the breast and more crowded patches on the inner metacarpal tubercle and on the upper side of the two inner fingers;

similar spines may also be scattered on the palmar and plantar surfaces.

Nasals large and in contact with each other and with the frontoparietals, which entirely cover the upper surface of the ethmoid; zygomatic branch of squamosal short. Omosternal style entire. Terminal phalanges slightly expanded at the end.

Measurements, in millimetres, of the type specimens.

	♂	♂	♂	♀	♀	♀
From snout to vent ..	109	91	70	110	90	75
Head ..	30	28	21	31	25	21
Width of head ..	40	35	27	40	32	28
Snout ..	10	9	7	10	9	7
Eye ..	10	9	7	10	9	7
Interorbital width ..	5.5	5	3	5	4	3
Fore limb ..	68	53	41	59	50	43
First finger ..	11	9	8	10	9	8
Second finger ..	10	8	7.5	9	8	7.5
Third finger ..	15	12	9	12	13	10
Fourth finger ..	10	8	7	9	8	7
Hind limb ..	143	126	100	137	125	114
Tibia ..	46	38	30	44	38	34
Foot ..	48	40	35	46	42	38
Third toe ..	22	18	18	22	21	19
Fourth toe ..	33	29	24	30	31	27
Fifth toe ..	24	19	18	23	22	19

Habitat. Yunnan at Tongchuan fu, where this large frog was found in great numbers by Messrs. Graham and Dymond. The types preserved in the British Museum.

This and the following species are intermediate between *R. sternosignata* and *R. hebigii*, but nearer the former.

32. *Rana spinosa*.

Rana kuhlii, part., Günth., *Cat. Batr. Sal.* p. 8 (1858), and *Rept. Brit. Ind.* p. 404, pl. xxvi, fig. A (1864); Bouleng., *Cat. Batr. Ecaud.* p. 20 (1882).

Rana latrans (non Steff.), David, *N. Arch. Mus.* VIII, 1872, *Bull.* p. 85, and *Journ. 3^e Voy. Emp. Chin.* II, p. 250 (1875).

Rana spinosa, David, *op. cit.* p. 253.

Rana boulengeri, Günth., *Ann. and Mag. N.H.* (6) IV, 1889, p. 222; Bouleng., *Proc. Zool. Soc.* 1899, p. 166.

Vomerine teeth in small oblique groups commencing on a line with and extending back beyond the level of the posterior borders of the choanae.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis very obtuse; loreal region very oblique, slightly concave; nostril nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width; which is a little less than that of the upper eyelid; tympanum hidden or very indistinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye.

Fingers feebly swollen at the tips, first longer than the second, third longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye, the heels overlapping when the limbs are folded at right angles to the body; tibia $2\frac{2}{3}$ to $3\frac{1}{2}$ times as long as broad, twice in length from snout to vent, or a little more or a little less, as long as or a little shorter than the foot, shorter than the fore limb. Toes with the tips swollen into small discs, entirely webbed; subarticular tubercles moderately large, moderately prominent; a feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Upper parts granulate or shagreened, with numerous warts, which may be small and subconical or large and elongate on the back; these warts may bear black horny spinules; a strong fold across the head behind the eyes, and a very strong glandular fold from the eye to the shoulder; lower parts smooth.

Dark olive or blackish brown above; lips with darker vertical bars; limbs with more or less distinct black cross-bars; hinder side of thighs black, with more or less distinct lighter marblings. Lower parts whitish, throat and lower surface of limbs spotted or marbled with blackish.¹

Males with internal vocal sacs; during the breeding-season the arms are remarkably thickened, and black horny spines are present, more or less scattered, on the whole breast and, closer together, on the inner metacarpal tubercle and on the upper side of the two or three inner fingers.

The skull is very similar to that of the preceding species, but the zygomatic branch of the squamosal is longer. Omosternal style entire.

Measurements in millimetres.

	1. ♂	2. ♂	3. ♂	4. ♂	5. ♂	6. ♀	7. ♀	8. ♂
From snout to vent ..	105	103	101	69	87	102	104	67
Head ..	31	30	30	22	27	29	29	20
Width of head ..	45	42	42	28	35	39	40	26
Snout ..	10	10	10	8	9	10	10	7
Eye ..	10	10	10	8	9	10	10	7
Interorbital width ..	5	6	6	4	5	6	6	4
Fore limb ..	68	68	60	41	51	61	57	36
First finger ..	14	11	11	8	9	11	11	8
Second finger ..	13	10	9	7	8	10	9	7
Third finger ..	16	14	13	10	11	13	13	10
Fourth finger ..	11	10	9	7	8	9	9	7
Hind limb ..	165	164	151	115	143	163	150	103
Tibia ..	51	52	48	36	46	51	49	35
Foot ..	55	52	50	36	45	51	49	34
Third toe ..	27	25	24	18	22	23	24	18
Fourth toe ..	39	38	35	25	33	36	34	25
Fifth toe ..	25	25	24	17	22	26	23	18

1—2. Ichang, types. 3—4. Kuatun. 5—6. Pingho. 7. Ningpo. 8. Man Son Mts., Tonkin.

¹ The coloration is thus described by David: Dessus brun olive, marqué de taches noirâtres rondes ou allongées et de pustules; cuisses et jambes avec sept raies noires; intérieur des cuisses noir marbré de blanc. Dessous blanchâtre; haut de la gorge marbré de brun. Iris brun doré.

Habitat. China, south of the Yangtse Kiang (Mountains of Kiangsi and between Kiangsi and Fokien¹, Ningpo, Pingho) and Tonkin (Man-Son Mts., 3000-4000 ft.).

Closely allied to the preceding species, but distinguished by the shorter tibia and the dilated tips of the toes.

33. *Rana gammiei*.

Rana gammii, part., Anders., *Journ. As. Soc. Beng.* XI., 1871, p. 21.

Rana gammiei, Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 138.

Vomerine teeth in rather long oblique series originating between the choanae and extending far behind them.

Head a little broader than long, much depressed; snout rounded, as long as the eye; canthus rostralis indistinct; loreal region very oblique, concave; nostril equidistant from the eye and from the tip of the snout; interorbital space a little narrower than the upper eyelid; tympanum hidden.

Fingers obtuse, first longer than the second, third longer than the snout; subarticular tubercles moderate.

The tibio-tarsal articulation reaches the posterior border of the eye; heels overlapping when the limbs are folded at right angles to the body; tibia $1\frac{3}{4}$ to nearly 2 times in length from snout to vent, as long as or a little shorter than the foot. Toes not quite entirely webbed, the tips swollen into small discs; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle $\frac{1}{4}$ the length of the inner toe; no outer tubercle.

Back with small scattered warts, each of which bears a minute spinule; a short, almost linear glandular fold above the tympanum.

Male without vocal sacs; arms thick; black horny spinules on the fore limbs and on the breast, as in *R. liebigii*.

Measurements in millimetres.

				♂ (type)	♀
From snout to vent	..	..	..	55	45
Head	..	..	..	20	14
Width of head	..	..	..	22	16
Snout	..	..	..	8	8
Eye	..	..	..	6	7
Interorbital width	..	..	..	5	5
Fore limb	..	..	..	7	26
First finger	..	..	..	8	8
Second finger	..	..	..	6	7
Third finger	..	..	..	10	9
Fourth finger	..	..	..	8	6
Hind limb	..	..	..	94	88
Tibia	..	..	..	37	27
Foot	..	..	..	31	27
Third toe	..	..	..	19	17
Fourth toe	..	..	..	23	21
Fifth toe	..	..	..	20	15

¹ The types of *R. latrans* and *R. boulengeri* are from the same locality, Ichang, so that no doubt can be entertained as to their specific identity; *R. spinosa* is from the mountains between the provinces Kiangsi and Fokien.

Habitat. Darjeeling, between 4000 and 6000 feet.

I have not seen specimens of this species. The above description is drawn up from notes kindly supplied to me by Dr. Annandale.

34. *Rana annandalii*, sp. n.

Vomerine teeth in short oblique series close together, originating between the choanae and extending beyond the level of their posterior borders.

Head a little broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as or shorter than the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril equidistant from the eye and from the end of the snout; the distance between the nostrils greater than the interorbital width, which is $\frac{2}{3}$ that of the upper eyelid; tympanum feebly distinct or hidden, $\frac{1}{4}$ the diameter of the eye, $\frac{2}{3}$ its distance from the latter.

Fingers obtuse, first and second equal, third a little longer than the snout; subarticular tubercles small, feebly prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ times as long as broad, $1\frac{1}{4}$ to $1\frac{1}{2}$ times in length from snout to vent, a little shorter than the fore limb, as long as the foot. Toes with the tips swollen into small discs, $\frac{3}{4}$ webbed, 2 phalanges of fourth free or only narrowly bordered by the web; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle narrow, feebly prominent $\frac{1}{3}$ or $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Upper parts smooth or with granules and small warts, which may be spinulose; a strong glandular fold from the eye to the shoulder; glandular dorso-lateral fold distinct only in front, from behind the eye to the scapular region, converging towards its fellow; lower parts smooth.

Olive above with darker marblings and small light spots; a dark cross-bar between the eyes; limbs with numerous dark cross-bars; white beneath, throat and breast spotted with brown.

Males without vocal sacs; fore limbs very strong; a patch of large black spines on each side of the breast and on the inner side of the first finger and on the metacarpal tubercle; smaller spines on the inner side of the fore limb and of the second finger.

Tadpole with very obtusely pointed tail about twice as long as the body. Buccal disc $\frac{1}{3}$ to $\frac{1}{2}$ the width of the body; upper lip with a series of papillae on the sides, lower with two complete series; beak entirely black; 4 or 5 series of upper labial teeth, only the outer continuous; 3 series of lower labial teeth, continuous or innermost narrowly interrupted. Tail with dark brown spots, some of which are large. Total length up to 45 millimetres.

Measurements in millimetres.

				1.	2.	3.	4.
				♂	♂	♀	♀
From snout to vent	..	..	..	41	52	46	45
Head	..	..	..	14	17	14	15
Width of head	..	..	..	15	18	15	16
Snout	..	..	..	4	5.5	4.5	5
Eye	..	..	..	5	5.5	5	5
Interorbital width	..	..	..	3	3	2	2.5
Fore limb	..	..	..	25	28	27	27
First finger	..	..	..	3.5	5	5	5
Second finger	..	..	..	3.5	5	5	5
Third finger	..	..	..	5	8	7	7.5
Fourth finger	..	..	..	3.5	5	5	5
Hind limb	..	..	..	73	91	80	27
Tibia	..	..	..	23	30	26	25
Foot	..	..	..	23	29	25	24
Third toe	..	..	..	11	16	15	14
Fourth toe	..	..	..	16	25	20	20
Fifth toe	..	..	..	11	16	14	14

1. Sureil. 2—3. Ghoom. 4. Pashok.

Two specimens, male and young, also tadpoles, from Sureil, Darjeeling district, 5500 ft., collected by Dr. Annandale. A male and two females, from the Suchal Waterworks, near Ghoom, in the same district, collected by Mr. S. W. Kemp, and a female from Pashok, alt. 4500 feet, together with tadpoles and young, collected by Dr. Annandale, are also preserved in the Indian Museum. They differ from the description of *R. gammiei* in the shorter snout, the shorter fingers, the first and second equal, the tibio-tarsal articulation reaching nearly the tip of the snout, and the presence of a short glandular fold from behind the eye to the scapular region.

[The Sureil specimens were taken, with others, of *R. assamensis*, amongst dense herbage at the edge of a small jungle-stream in October. N. A.]

35. *Rana liebighii*.

Megalophrys gigas, Blyth, *Fourn. As. Soc. Beng.* XXIII, 1854, p. 209.

Rana liebighii, Günth., *Proc. Zool. Soc.* 1860, p. 157, pl. xxviii, fig. A, and *Rept. Brit. Ind.* p. 407 (1864); Anders., *Proc. Zool. Soc.* 1871, p. 198; Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 103; Theob., *Proc. As. Soc. Beng.* 1873, p. 111; Günth., *Proc. Zool. Soc.* 1875, p. 567; Bouleng., *Cat. Batr. Ecaud.* p. 21, fig. (1882) and *Faun. Ind., Rept.* p. 445 (1890); W. Sclater, *Proc. Zool. Soc.* 1892, p. 343; Annand., *Fourn. As. Soc. Beng.* (2) II, 1906, p. 290. *Rec. Ind. Mus.* VIII, 1912, p. 21, and *Mem. As. Soc. Beng.* VI, 1917, p. 136.

Rana sikkimensis, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83; Stoliczka, *l. c.* *Rana gigas* (non Laur.), Peters, *Sitzb. Ges. Nat. Fr. Berl.* 1881, p. 87.

Vomerine teeth in feeble groups or oblique series between the choanae and extending beyond the level of their posterior borders.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as or shorter than the eye; canthus rostralis indistinct; loreal region oblique, concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils a little greater

than the interorbital width, which equals or nearly equals that of the upper eyelid; tympanum small, hidden or very indistinct.

Fingers obtuse, first as long as or slightly shorter than the second, third longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, $1\frac{3}{4}$ to 2 times in length from snout to vent, longer than the foot, nearly as long as or shorter than the fore limb. Toes with the tips swollen into small discs, entirely webbed, the web almost rectilinear or more or less notched; subarticular tubercles moderately large, moderately prominent; no tarsal fold; inner metatarsal tubercle oval or elliptical, feebly prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Smooth above, or with granules and small warts; a more or less distinct fold across the head behind the eyes and a strong glandular fold from the eye to the shoulder; a moderately broad but usually very prominent dorso-lateral glandular fold, exceptionally very indistinct or broken up into a chain of warts, slightly converging towards its fellow on the anterior part of the back, where the distance between the two is $5\frac{1}{2}$ to 7 times in the length of head and body; lower parts smooth.

Olive or brown above, uniform or with small darker spots, sides with large dark marblings, the dorso-lateral folds often edged with blackish; a blackish streak on the canthus rostralis and a blackish temporal spot; limbs usually with irregular dark cross-bars. Lower parts brownish, or whitish marbled with brown.

Males with internal vocal sacs; during the breeding season the arms are remarkably thickened and groups of black horny spines are present on each side of the breast, on the inner side of the arm and on the upper side of the three inner fingers. After the nuptial period, the male has but moderately strong forelimbs, without spines, but may be distinguished from the female by the large and very prominent inner carpal tubercle; the dorsal warts and granules may bear minute horny spinules (male from Ghoom near Darjeeling, from Mrs. Kemp's collection in the Indian Museum).

Skeleton very similar to that of *R. temporaria*. Nasals rather small and separated on the median line; ethmoid uncovered in front; zygomatic process of squamosal moderately long. Omosternal style entire. Terminal phalanges with short transverse expansion at the end.

The tadpole is known from Darjeeling specimens. Tail pointed, $2\frac{1}{2}$ to 3 times as long as head and body. Lips large, the upper with a series of papillae on the sides only, the lower with two complete series; beak entirely black; 7 or 8 series of upper labial teeth, the 2 or 3 outer continuous; 3 series of lower labial teeth, the 2 outer continuous, the inner narrowly interrupted.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	♂	♂	♂	♂	♀	♀	♀	♀	♀	♂
From snout to vent ..	67	123	97	79	97	94	85	78	78	90
Head ..	22	35	29	23	27	27	25	23	25	29
Width of head ..	27	49	40	31	39	39	33	27	35	37
Snout ..	7	13	10	8	10	11	8	7	9	10
Eye ..	8	13	10	8	11	11	9	9	9	10
Interorbital width ..	4.5	8	6	5	6	6	5	5	7	6
Fore limb ..	40	73	58	47	60	57	52	47	50	51
First finger ..	7	11	10	8	10	10	9	7	10	10
Second finger ..	7	11	18	8	10	10	9	8	10	10
Third finger ..	11	16	15	12	15	14	13	12	13	13
Fourth finger ..	8	11	11	9	11	11	10	9	9	11
Hind limb ..	117	180	160	126	155	164	146	137	147	157
Tibia ..	39	64	55	40	52	55	45	43	47	50
Foot ..	37	55	50	38	50	51	45	42	45	48
Third toe ..	18	33	26	20	25	28	23	21	24	24
Fourth toe ..	27	41	37	29	35	37	34	33	34	35
Fifth toe ..	18	31	25	19	25	27	23	22	23	23

1. Sikkim (type). 2—6. Darjiling. 7—8. Lialing, Sikkim, 8500 f. 9. Simla.
10. Nepal (type).

Habitat. Himalayas, between 4000 and 10,000 feet, chiefly at altitudes near the snow-line in Sikkim. The locality Tavoy, Tenasserim, recorded by W. Sclater, seems very doubtful.

36. *Rana assamensis*.

Rana gammii, part., Anders., *Journ. As. Soc. Beng.* XL, 1871, p. 21.

Rana assamensis, W. Sclater, *Proc. Zool. Soc.* 1892, p. 343, pl. xxiv, fig. 2.

Rana vicina, part., Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 137, fig.

Vomerine teeth in short oblique series exactly between the choanae.

Head a little broader than long, much depressed; snout rounded, but slightly projecting, as long as or slightly longer than the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril equidistant from the eye and from the end of the snout; the distance between the nostrils greater than the interorbital width, which equals or is a little less than that of the upper eyelid; tympanum very distinct, barely half the diameter of the eye, $\frac{2}{3}$ to once its distance from the latter.

Fingers obtuse, first as long as the second, third as long as or longer than the snout; subarticular tubercles well developed.

Hind limb long, the tibio-tarsal articulation reaching a little beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, $1\frac{1}{2}$ to $1\frac{1}{4}$ times in length from snout to vent, longer than the foot. Toes with swollen tips, entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles well developed; tarsal fold present; inner metatarsal tubercle narrow, feebly prominent, $\frac{1}{2}$ to $\frac{2}{3}$ the length of the inner toe; no outer metatarsal tubercle.

Skin smooth; a narrow, feebly prominent, sometimes interrupted, dorso-lateral glandular fold, converging towards its fellow

on the anterior part of the back, where the distance between the two is $\frac{1}{8}$ to nearly $\frac{1}{6}$ the length of head and body; a strong glandular fold from the eye to the shoulder; lower parts smooth.

Brown above, with blackish canthal and temporal band, the latter involving the tympanum; a dark cross-band between the eyes; lips with dark vertical bars; dorso-lateral fold sometimes whitish, edged with blackish on the outer side; limbs with dark cross-bands. Whitish beneath, with dark mottling on the sides of the throat.

Tadpoles, obtained at Kurseong by Dr. Annandale, are very similar to those of *R. liebighii*. Tail pointed, $2\frac{1}{4}$ to $2\frac{1}{2}$ times as long as the body. Lips large, the upper with a series of papillae on the sides, the lower with two complete series; beak entirely black; 7 series of upper labial teeth, only the outer continuous; 3 series of lower labial teeth, all continuous or the inner or the 2 inner very narrowly interrupted. Total length up to 58 millimetres.

Measurements in millimetres.

	1.	2.	3.
From snout to vent	74	75	55
Length of head	24	16	20
Width of head	26	17	21
Snout	10	5	7
Eye	9	5	6
Interorbital width	5	3	3.5
Tympanum	3.5	2	3
Fore limb	42	28	33
First finger	8	5	7
Second finger	8	5	7
Third finger	10	7	8.5
Fourth finger	7	5	7
Hind limb	125	84	104
Tibia	45	29	35
Foot	38	24	30
Third toe	18	12	15
Fourth toe	31	20	24
Fifth toe	23	14	18

1—2. Pashok. 3. Kurseong.

Habitat. Khasi hills and Eastern Himalayas.

[This frog is very common amongst dense herbage in low bushes at the edge of shady jungle streams in the Eastern Himalayas at altitudes between 4 and 6000 ft. *N. A.*]

This species was established on a single female specimen, then in the Indian Museum, procured by the late Dr. Jerdon in the Khasi hills. I took notes on the specimen before its return to the Indian Museum, from which, I am informed by Dr. Annandale, it has now disappeared. I have also examined two female specimens from Pashok, Darjiling district, 3500 ft., and a third from Kurseong in the same district, preserved in the Indian Museum; the above measurements are taken from these specimens.

Dr. Annandale united *R. assamensis* with *R. vicina*, but the former differs from the latter in three important characters:—The position of the vomerine teeth, which do not extend at all beyond the level of the posterior borders of the choanae; the distinct

tympanum; and the presence of a glandular dorso-lateral fold, which, in my notes, I mention to be certainly present, contrary to the statement of Mr. Sclater.

Dr. Annandale has since informed me that he agrees with the suggestion I made to him that what he took to be the male of *R. vicina* is the male of *R. assamensis*, which had already been alluded to by Anderson in his description of *R. gammtei*.

In the breeding male there is no thickening of the arms and inner finger, there are no spines either on the fore limbs or on the chest; but a very peculiar secondary sexual character is the presence of a cutaneous flap of almost circular outline, covered with small papillae, each of which bears a short retroverted spine.

37. *Rana vicina*.

Rana vicina, Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 130; W. Sclater,

Proc. Zool. Soc. 1892, p. 342, pl. xxiv, fig. 1.

Rana liebigii, part., Annand., *Rec. Ind. Mus.* III, 1909, p. 282.

Rana vicina, part., Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 137, fig.

Vomerine teeth in small oblique groups between the choanae and extending a little beyond the level of their posterior borders.

Head a little broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region oblique; nostril a little nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which equals that of the upper eyelid; tympanum hidden.

Fingers obtuse, first as long as the second, third a little longer than the snout; subarticular tubercles well developed.

Hind limb long, the tibio-tarsal articulation reaching nearly the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, $1\frac{2}{3}$ times in length from snout to vent, a little longer than the foot. Toes with swollen tips, entirely webbed; subarticular tubercles well developed; inner metatarsal tubercle narrow, feebly prominent, about half the length of the inner toe; no outer metatarsal tubercle.

Skin smooth, with a few tubercles on the flanks; a feebly marked transverse fold across the head behind the eyes, and a glandular fold from the eye to the shoulder.

Male without secondary sexual characters.

The above description is taken from the type specimen, which Mr. W. Sclater allowed me to examine in 1892.

The coloration of the same specimen is thus described by Stoliczka:—

Above ashy olive, with the tubercles on the body whitish; a narrow dusky band between the eyes; a black, somewhat interrupted stripe from the pale tip of the snout to the eye, skirting the edges of the eye and continuing as a broader band to the shoulder; lips black; hind limbs, above, with numerous trans-

verse dark bands ; front and hinder side of both limbs, involving the fingers and toes, very distinctly variegated with black ; lower lip spotted with black ; chin and breast dusky, rest of lower side yellowish white.

From snout to vent 57 millim.

The type specimen was procured by Stoliczka at Murree, Punjab, Western Himalayas, altitude 6000 feet. The second specimen from near Simla, mentioned by Sclater, is now in the British Museum, and has been dealt with under *R. liebigii*.

38. *Rana blanfordii*.

Rana blanfordii, Bouleng., *Cat. Batr. Ecaud.* p. 23, pl. i, fig. 2 (1882), and *Ann. and Mag. N.H.* (7) XVI, 1905, p. 640; Annand., *Rec. Ind. Mus.* III, 1909, p. 283, and *Mem. As. Soc. Beng.* VI, 1917, p. 139. *Rana vicina* (non Stoll.), Bouleng., *Rec. Ind. Mus.* I, 1907, p. 150; Annand., *Rec. Ind. Mus.* II, 1908, p. 346.

Vomerine teeth in feeble groups or oblique series between the choanae and extending beyond the level of their posterior borders.

Head a little broader than long, rather strongly depressed ; snout rounded, scarcely projecting beyond the mouth, as long as the eye ; canthus rostralis obtuse ; loreal region oblique, concave ; nostril a little nearer the eye than the end of the snout ; the distance between the nostrils greater than the interorbital width, which equals or is a little less than that of the upper eyelid ; tympanum rather distinct or very indistinct, about $\frac{1}{2}$ the diameter of the eye, only a little longer than its distance from the latter.

Fingers obtuse, first shorter than the second, third longer than the snout ; subarticular tubercles moderately large, very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia $3\frac{1}{2}$ to 4 times as long as broad, twice in length from snout to vent or a little more or a little less, as long as or a little longer than the foot, shorter than the fore limb. Toes with the tips swollen into small discs, $\frac{2}{3}$ to $\frac{3}{4}$ webbed, the web deeply emarginate and extending only as a fringe to the tip of the fourth ; outer metatarsals separated nearly to the base ; subarticular tubercles moderately large, moderately prominent ; no tarsal fold ; inner metatarsal tubercle narrow, feebly prominent, about half the length of the inner toe ; no outer metatarsal tubercle.

Skin smooth above or with small granules and elongate flat glands ; a glandular fold from the eye to the shoulder ; lower parts smooth.

Olive above, with small blackish spots which may have a light centre ; a blackish cross-bar between the eyes and a blackish streak on the canthus rostralis and on the temporal region ; limbs with interrupted dark cross-bars. Lower parts white, throat of male brownish or marbled with brown. According to Annandale

the throat and thighs of the breeding male are suffused with a bright claret-colour.

Males without secondary sexual characters.

Nasal bones small, separated from each other and from the frontoparietals; ethmoid largely uncovered in front.

The eggs are very large: in the female specimen measuring 50 millim. from snout to vent the uterine eggs have a diameter of 3 millim., exactly in the same proportion as in *Alytes obstetricans*.

Tadpoles from Bim Tal, E. Himalayas, 4,450 ft., received under the name of *R. blanfordii* from the Indian Museum in 1915, reach a large size: 60 millim., in which the tail enters for 43. Tail obtusely pointed. Beak black; 5 series of upper labial teeth, the outermost uninterrupted, the second narrowly interrupted, the following broadly interrupted and gradually shorter; 3 series of lower labial teeth, the innermost narrowly interrupted, the two others uninterrupted. Identical specimens from near Phagu, Simla district, 7000 ft., were received from the Indian Museum in 1909 under the name of *R. vicina*.

Measurements in millimetres.

	1.	2.	3.	4.	5.
	♂	♀	♂	♂	♂
From snout to vent ..	39	50	35	32	32
Head ..	13	14	12	11	11
Width of head ..	14	15	13	12	12
Snout ..	4	5	4	4	3.5
Eye ..	4	5	4	4	3.5
Interorbital width ..	3	3	3	2.5	2.5
Tympanum ..	2	2.5	2	2	2
Fore limb ..	26	27	21	18	19
First finger ..	4	4	4	4	4
Second finger ..	5	5.5	4.5	4.5	4.5
Third finger ..	6	6.5	5	5	5
Fourth finger ..	5	5.5	4.5	4	4
Hind limb ..	75	77	63	55	57
Tibia ..	23	24	19	16	17
Foot ..	21	23	19	16	17
Third toe ..	10	13	10	9	9
Fourth toe ..	15	18	15	13	13
Fifth toe ..	10	13	10	9	9

1—2. Darjiling (types). 3. Mussoorie, 6000—7000 ft. 4—5. Balaya Valley, near Naini Tal, 5000 ft.

Habitat. The Himalayas. The types are almost certainly from the Darjiling district. According to Annandale this species is very common in the Western Himalayas, at altitudes from 6000 to 10,000 feet. "It is largely aquatic in its habits, at any rate during the daytime. Specimens taken at the beginning of October appeared to be breeding; the females contained large ova" (Annandale, 1907). "In wet weather and in places where there is a plentiful water-supply it is aquatic in habits. In the neighbourhood of Simla, however, it conceals itself during the dry season. Large tadpoles are common in the W. Himalayas in mountain streamlets and in wells both in May and September."

39. *Rana plancyi*.

Rana plancyi, Lataste, *Le Naturaliste*, 1880, p. 210, and *Bull. Soc. Zool. France*, 1880, p. 64; Boulenger, *Cat. Batr. Ecaud.* p. 37 (1882); Stejneger, *Herp. Jap.* p. 101 (1907).

Vomerine teeth in more or less oblique groups or short series between the choanae, or extending little beyond the level of their posterior borders, equally distant from each other and from the choanae or nearer each other.

Head rather depressed, as long as broad; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis very obtuse; loreal region oblique, slightly concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to once the diameter of the eye, close to it or narrowly separated.

Fingers moderate, pointed, first longer than the second, third longer than the snout; subarticular tubercles rather small, moderately prominent.

Hind limb moderate, the tibio-tarsal articulation reaching the tympanum or the eye, the heels meeting or narrowly separated when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, 2 to $2\frac{3}{4}$ times in length from snout to vent, much shorter than the fore limb or than the foot. Toes pointed, fully webbed or last phalanx of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles small, moderately prominent; no tarsal fold; inner metatarsal tubercle compressed, more or less oblique, $\frac{3}{4}$ to $\frac{2}{3}$ the length of the inner toe; a small, rather indistinct outer tubercle.

Skin smooth; a prominent glandular dorso-lateral fold, from above the tympanum to the hip, broad or rather broad, often as broad as the upper eyelid.

Olive above (green in life?), uniform or with small dark spots; a more or less distinct dark streak on the canthus rostralis; dorso-lateral fold and tympanum bronzy; a light vertebral streak sometimes present; a blackish band along the hinder side of the thigh and another, sometimes indistinct, along each side of the belly. Lower parts white, uniform or with small brown spots on the throat and breast.

Males with internal vocal sacs and a moderately large pad on the inner side of the first finger.

Nasal bones large, in contact with each other and with the frontoparietals. Omosternal style entire. Terminal phalanges pointed.

Habitat. China and Formosa.

[Very abundant at the edge of the T'ai-Hu (Great Lake) inland from Shanghai. N. A.]

This species is very closely allied to *R. esculenta*, but less specialized, and constitutes a link with the American frogs allied to *R. catesbiana*.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
From snout to vent	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♂	♀	♀	♂	♂	♀
Head	..	48	54	44	42	56	55	48	45	44	41	45	45	47	45	45
Width of head	..	17	16	19	16	14	19	17	15	17	16	16	16	17	17	16
Snout	..	17	16	19	16	14	19	17	15	17	16	16	16	17	17	16
Eye	..	6	6	6.5	5.5	5	7	6.5	6	6	6	6	6	6	6	6
Interorbital width	..	6	5	6.5	5.5	6	6	6	5.5	6	6	6	6	6	6	6
Interorbital width	..	2.5	2	2.5	2	2.5	2	2	2	2	2	2	2.5	2	2	2
Tympanum	..	5	4	5.5	4	3.5	5	4	4	5	4	4	4	4	4	4
Fore limb	..	20	28	31	25	23	31	27	25	26	24	25	26	28	26	26
First finger	..	6	6	7	6	5.5	7	6	6	6.5	6	6	6	7	6	6
Second finger	..	5	5	5.5	5	4.5	6	5	5	5.5	5	5	5	6	5	5
Third finger	..	7	7	7.5	6.5	6	8	7	7	7.5	7	7	7	8	7	7
Fourth finger	..	5	5	5	5	4	4.5	5	5	5.5	5	5	5	5	5	5
Hind limb	..	73	71	80	65	59	80	77	69	76	67	72	67	71	73	72
Tibia	..	21	20	23	18	17	22	21	19	21	20	22	20	20	21	21
Foot	..	27	26	31	25	23	30	27	25	23	23	26	25	26	24	25
Third toe	..	16	15	17	14	12	17	16	15	12	16	13	15	16	14	15
Fourth toe	..	24	23	26	21	18	26	24	21	19	24	20	21	22	20	21
Fifth toe	..	18	16	20	16	14	21	19	17	15	17	15	18	17	16	16
First toe	..	5.5	5	5.5	5	4	6	5.5	5	6	5	6	6	6	5.5	5.5
Inner metatarsal tubercle	..	3.5	3.5	3.5	3	2.5	4	3.5	3.5	3	2.5	3	3	3	2.5	2.5

1—2. Shanghai. 3—5. Chusan. 6. Chusan. 7—9. Ningpo. 10—13. Taiwanfoo, Formosa. 14—16. Formosa.

40. *Rana esculenta*.

Rana esculenta, Linn., *Syst. Nat.* I, p. 357 (1766) : Bouleng., *Proc. Zool. Soc.* 1891, p. 604, and *Ann. and Mag. N.H.* (9) II, 1918, p. 241, figs.

This widely distributed species, of which the typical form is exclusively European, is represented within the limits assigned to this monograph by two varieties, the most remote from each other in the series, and easily defined when the European forms are left out of consideration.

Var. *ridibunda*.

Rana ridibunda, Pallas, *Reise*, I, p. 458 (1771).

Rana esculenta, Blanf., *Zool. E. Pers.* p. 432 (1876).

Rana esculenta, var. *ridibunda*, Bouleng., *Proc. Zool. Soc.* 1885, p. 666, pl. xl, and *Taill. Batr. Eur.* p. 270, pl. xvi (1898); Nikolsky, Fetschenko's *Reise*, *Zool.* II, vii, p. 71 (1899).

Rana esculenta, var. *susana*, Bouleng., *Ann. and Mag. N.H.* (7) XVI, 1905, p. 552.

Vomerine teeth in short transverse or more or less oblique series between the choanae or extending slightly beyond their posterior borders, close together or nearer to each other than to the latter, rarely equally distant from both.

Head as long as broad or, usually, a little broader than long, rather strongly depressed; snout rounded or obtusely pointed, as long as or longer than the eye, more or less projecting beyond the mouth; canthus rostralis obtuse or very indistinct; loreal region very oblique; nostril equally distant from the eye and from the end of the snout, or nearer the former; distance between the nostrils greater than the interorbital width, which is $\frac{1}{2}$ to $\frac{3}{4}$ that of the upper eyelid; tympanum very distinct, $\frac{3}{8}$ to $\frac{1}{2}$ the diameter of the eye.

Fingers obtusely pointed, first as long as or a little longer than the second, third longer than the snout; second and third fingers with a more or less distinct dermal border; subarticular tubercles small, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the tympanum, the eye, or between the eye and the tip of the snout, the heels usually overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, $1\frac{1}{2}$ to slightly over twice in the length from snout to vent, a little shorter than the foot. Toes obtuse, usually nearly entirely webbed, rarely only $\frac{3}{4}$ ¹; outer metatarsals separated nearly to the base; subarticular tubercles small; inner metatarsal tubercle moderately prominent, oval or elliptical, $\frac{1}{3}$ to nearly $\frac{1}{2}$ the length of the inner toe; a small outer tubercle; tarsal fold feeble or absent.

Skin of back smooth or more or less warty; a glandular dorso-lateral fold from above the tympanum to the hip, sometimes interrupted posteriorly, sometimes very feebly prominent, its width

¹ I have examined several specimens, from Wadi-Sukerier, Palestine, in the Indian Museum, the two last phalanges of the fourth toe of which are free from the web.

equal to or less than that of the upper eyelid. Lower parts smooth, or posterior part of belly feebly granulate.

Green, olive, brown, or grey above, with dark olive or blackish spots, which are sometimes transversely dilated; dorso-lateral fold bronzy or of the same colour as the back, the spots often extending over it; sometimes a pale green vertebral streak or broad band; limbs with or without dark cross-bands; hinder side of thighs olive, or whitish marbled with olive or blackish. Lower parts white, often speckled, spotted or marbled with blackish.

Males with grey or blackish external vocal sacs, retractile into a slit behind the commissure of the jaws; fore limb strong; a pad-like swelling at the base of the inner finger, covered, during the breeding season, with a grey layer of minute horny granules.

Nasal bones moderately large, transverse or more or less oblique, meeting or narrowly separated on the median line, not in contact with the frontoparietals; only a small portion of the ethmoid uncovered above in the adult: zygomatic process of squamosal long, at least as long as the posterior process. Omosternal style entire. Terminal phalanges slightly expanded distally.

Eggs small, 1 to 1½ millim. in diameter.

Tadpole with the tail about twice the length of the body and acutely pointed. Beak broadly edged with black; lips bordered with papillae on the sides and on the lower border; upper lip with a long series of horny teeth, followed on each side by a short series; lower lip with 3 series of teeth, the 2 outer uninterrupted, the innermost also uninterrupted, or narrowly interrupted.

Habitat. Southern and Eastern Europe, North Africa, Asia as far south as the Sinaitic Peninsula, as far east as Turkestan, Baluchistan and Afghanistan.

Var. *chinensis*.

- Rana chinensis*, Osbeck, *Voy. China*, I, p. 209 (1771); Bonnat., *Encycl. Méth.*, *Erp.* p. 6 (1789); Stone, *Proc. Ac. Philad.* 1899, p. 183; Bolkay, *Allatt. Kösl. Budapest*, VIII, 1909, p. 53, pl. viii, and *Proc. Washingt. Ac.* XIII, 1911, p. 67, pl. vi.
- Rana esculenta*, Schleg., *Faun. Japon.*, *Rept.* p. 109, pl. iii, fig. 1 (1836).
- Rana esculenta*, var. *japonica*, Maack, *Voy. Amour*, p. 153 (1859); Bouleng., *Cat. Batr. Ecaud.* p. 40, fig. (1882).
- Rana marmorata*, Hallow., *Proc. Ac. Philad.* 1860, p. 500; Camerano, *Atti Acc. Torin.* XIV, 1879, p. 871.
- Rana nigromaculata*, Hallow., *l.c.*; Stejneger., *Herp. Jap.* p. 94, fig. (1907); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 140, pl. vi, fig. 4.
- Hoplobatrachus reinhardti*, Peters, *Mon. Berl. Ac.* 1867, p. 711.
- Tomopterna porosa*, Cope, *Proc. Ac. Philad.* 1868, p. 111.
- Rana reinhardti*, Moellend., *Journ. N. China Br. As. Soc.* (2) XI, 1877, p. 105.
- Rana esculenta marmorata*, Lataste, *Bull. Soc. Zool. France*, 1880, p. 61.
- Rana porosa*, Bouleng., *Cat. Batr. Ecaud.* p. 40.
- Rana esculenta*, var. *nigromaculata*, Bouleng., *Proc. Zool. Soc.* 1891, p. 376; Bedriaga, *Wiss. Res. Przewalski Exped.*, *Zool.* III, i, p. 11 (1899); Werner, *Abh. Bayer. Ak.* XXII, 1903, p. 358.
- Rana esculenta*, var. *chinensis*, Bouleng., *Taill. Batr. Eur.* p. 272 (1898); Méhely, *Zool. Ergebn. Zichy Forschungsgr.* p. 62 (1899); Wolterst., *Abh. Mus. Magdeb.* I, 1906, p. 135.

Head not or but slightly broader than long; snout usually pointed, but sometimes rounded; interorbital space $\frac{2}{3}$ to $\frac{3}{4}$ the width of the upper eyelid; tympanum $\frac{2}{3}$ to $\frac{7}{8}$ the diameter of the eye.

First finger constantly longer than the second.

Tibio-tarsal articulation reaching the tympanum, the eye, or the nostril; heels meeting, or failing to meet; tibia $2\frac{1}{2}$ to $3\frac{1}{2}$ times as long as broad, usually much shorter than the foot; toes $\frac{2}{3}$ to nearly entirely webbed, 1 or 2 phalanges of fourth free; inner metatarsal tubercle large, compressed, semicircular or semielliptic, its base more or less oblique to the axis of the foot, 1 to $1\frac{1}{2}$ times in the length of the inner toe, and 5 to 8 times in that of the tibia; this tubercle often connected with the inner toe by a membrane which penetrates into the distal third of its base.

Back with more or less distinct elongate glandular or interrupted glandular folds; dorso-lateral glandular fold prominent, $\frac{1}{2}$ to $\frac{3}{4}$ the width of the upper eyelid, extending to the hip, or if broken up posteriorly not deviating from its course.

Coloration very variable. Green, olive, or brown above, with or without black spots which may form longitudinal bands or cross-bars on the back; a pale green or yellow vertebral streak or band usually present, the dorso-lateral folds also of a pale colour and standing out very conspicuously; some specimens black above, with three yellow streaks; hind limbs usually with well-marked dark cross-bands; exceptionally a fine light line along the inner side of the upper surface of the tibia; groin and hinder side of thighs yellow, marbled with black. Lower parts white, always unspotted. Vocal sacs grey to blackish.

Habitat. Amoor Province of Siberia, Saghalien Island, Japan, Corea, Mongolia, China.

The localities Loo Choo Islands and Bangkok, Siam, appended to specimens presented by Mr. G. F. Mason to the British Museum, are probably erroneous.

Measurements in millimetres.

	var. <i>ridibunda</i> .										var. <i>chinensis</i> .				
	1. ♂	2. ♀	3. ♂	4. ♀	5. ♂	6. ♂	7. ♀	8. ♀	9. ♂	10. ♀	11. ♂	12. ♀	13. ♀	14. ♀	15. ♀
From snout to vent ..	67	86	64	63	58	72	75	90	84	79	55	66	50	70	82
Head ..	24	28	23	22	21	25	24	29	29	24	21	23	17	24	28
Width of head ..	24	30	24	23	21	26	25	32	31	26	21	23	17	24	29
Snout ..	9	12	8	9	7	10	10	11	11	10	7	9	6	10	12
Eye ..	7	8	8	7	6	8	7	9	9	8	6	7	6	9	8
Interorbital width ..	2	2.5	2.5	2.5	2	2.5	2.5	3	2.5	2.5	2	2.5	2	2.5	4
Tympanum ..	5	6	5	5	4	5	5	6	6	5	5	6	4	6	7
Fore limb ..	35	47	33	35	35	40	39	50	45	43	32	38	26	38	45
First finger ..	7	11	7	8	7.5	7	9	12	10	9	6.5	8	5.5	8	9
Second finger ..	6	10	7	8	7	7	8	11	10	9	5	7	5	7	8
Third finger ..	11	14	9	11	11	11	12	14	13	13	8.5	10	7	10	11
Fourth finger ..	6	9	6	6.5	6	7	8	9	9	8	5	7	4	6	6
Hind limb ..	103	128	93	92	90	109	110	122	125	119	88	102	74	109	125
Tibia ..	34	43	29	29	27	34	35	43	41	37	28	33	23	34	38
Foot ..	35	44	31	31	31	39	38	48	45	42	32	39	27	40	45
Third toe ..	19	24	16	17	18	21	21	26	27	23	16	19	14	19	21

	var. <i>ridibunda</i> .										var. <i>chinensis</i> .				
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
	♂	♀	♂	♀	♂	♂	♀	♀	♂	♀	♂	♀	♀	♀	♀
Fourth toe ..	30	37	25	25	26	33	33	40	38	36	27	33	23	33	36
Fifth toe ..	22	27	17	19	20	24	24	30	30	27	20	24	15	23	25
First toe ..	9	12	7	7.5	8	9	9	11	11	11	5.5	8	4.5	5	8
Inner metatarsal tubercle ..	3.5	4	3	3	3	3.5	3.5	4	5	4	4.5	5	3.5	5	5

1—2. Kermanshah, S.W. Persia, 6000 f. 3—4. Susa, S.W. Persia (type of var. *susana*). 5. Shiraz, S.W. Persia. 6—7. Kazerun, S.W. Persia. 8. Nr. Sarawan, Baluchistan. 9. Turbat, Afghanistan. 10. Chinese Turkestan. 11—12. Shanghai. 13. Chusan. 14. Ningpo. 15. Mountains N. of Kiukiang.

There has been much discussion as to the propriety of assigning specific rank to the two forms here described. I have recently (1918) expressed very fully my views on this subject, and the arguments I have adduced have a bearing on the status of *R. tigrina* and *R. crassa*, as noticed above.

41. *Rana pleuraden*.

Rana pleuraden, Bouleng., *Ann. and Mag. N.H.* (7) XIII, 1904, p. 131.

Vomerine teeth in two oblique groups or short series between the choanae, nearer to each other than to the latter.

Head moderately depressed, as long as broad; snout obtusely pointed, prominent, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region oblique, concave; nostril equidistant from the eye and from the end of the snout; distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{1}{2}$ the diameter of the eye and 2 to 4 times its distance from the latter.

Fingers rather slender, obtusely pointed, first longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, twice or a little more than twice in length of head and body, shorter than the fore limb, which nearly equals the length of the foot. Toes rather long and slender, obtusely pointed, $\frac{1}{2}$ webbed, 3 phalanges of fourth and 2 of third and fifth free; outer metatarsals separated nearly to the base; subarticular tubercles rather feeble; no tarsal fold; inner metatarsal tubercle oval, prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth or with small warts which may bear small conical asperities; a moderately broad, very prominent dorso-lateral glandular fold, from above the tympanum to the groin; the distance between the dorso-lateral folds, on the back, $\frac{3}{4}$ to $\frac{1}{2}$ the length of head and body. Lower parts smooth.

Olive-brown or greyish above, spotted with black; a light vertebral streak, narrow or broad, usually present; a dark brown or

blackish band on each side of the head, passing through the eye and involving the tympanum; a whitish streak along the upper lip; limbs with more or less regular black cross-bars; sometimes a light line along the inner side of the leg, continued to the outer toe; hinder side of thighs marbled black and yellow. Lower parts white, throat sometimes brownish.

Males with a vocal sac on each side, forming loose folds on the throat and a very large flat gland on each side of the body, above and behind the shoulder; inner side of first finger feebly thickened, with a nearly smooth horny layer.

Eggs very small, 1 millim. in diameter.

Nasal bones large and in contact with each other, separated from the frontoparietals, which do not cover the ethmoid in front; zygomatic branch of squamosal not longer than the posterior. Omosternum entire. Terminal phalanges very feebly expanded at the end.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.
	♂	♂	♂	♀	♀	♀	♀	♀
From snout to vent ..	58	48	47	64	51	68	64	52
Head ..	20	17	17	21	17	22	21	17
Width of head ..	20	17	17	21	17	22	21	17
Snout ..	7	6	6	8	6	9	7	6
Eye ..	6	5	5	7	5	8	7	5
Interorbital width ..	2.5	2.5	2.5	3	3	3	3	3
Tympanum ..	4	3	4	4	3.5	5	4	4
Fore limb ..	34	29	28	35	30	38	34	32
First finger ..	7	6	6	7	6	8	8	7
Second finger ..	6	5	5	5	5	7	7	6
Third finger ..	10	8	7	10	8	11	10	10
Fourth finger ..	6	5	4	6	5	6	5	6
Hind limb ..	97	82	80	106	87	113	100	89
Tibia ..	29	24	24	32	26	34	30	26
Foot ..	34	28	28	34	31	37	35	31
Third toe ..	18	14	13	18	16	20	18	16
Fourth toe ..	25	22	21	28	26	30	28	25
Fifth toe ..	18	16	14	20	17	21	19	17

1—5. Yunnan fu (types). 6—8. Tongchuan fu.

Habitat. Yunnan. Types in the British Museum.

A very remarkable frog, combining characters of *R. esculenta* and of the species clustering round *R. temporaria*.

42. *Rana grahami*.

Rana grahami, Bouleng., *Ann. and Mag. N.H.* (8) XX, 1917, p. 415.

Vomerine teeth in transverse or slightly oblique series between the choanae or extending a little beyond the level of their posterior borders.

Head as long as broad or a little broader than long, much depressed; snout rounded or obtusely pointed, feebly or rather strongly projecting beyond the mouth, as long as the eye or a little shorter; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril equidistant from the eye and from the tip of the snout or a little nearer the former; the distance between the

nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye and 2 to 4 times its distance from the latter.

Fingers rather long, the tips feebly swollen, first as long as or a little longer than the second, third much longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond; heels overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, $1\frac{3}{4}$ to $1\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb, as long as or a little longer than the foot. Toes with the tips slightly swollen, entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle rather small, feebly prominent, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Skin smooth above or finely corrugated, often with large flat warts on the back, sides granulate, with large warts, some of which may bear minute white spinose tubercles; a broad glandular dorso-lateral fold sometimes present but much broken up; one or two large glands behind the angle of the mouth. Lower parts smooth or posterior part of belly granulate.

Olive above, with more or less distinct darker spots and often speckled or mottled with black; sides yellow with large black spots or marblings; limbs with numerous dark cross-bands which may be broken up into spots or marblings; hinder side of thighs yellow, spotted or marbled with black. Lower parts white, throat and breast sometimes spotted with blackish.

Males with internal vocal sacs; fore limb¹ much thickened; the inner finger with a large pad covered, during the breeding season, with a velvety yellowish or greyish horny layer.

Nasals small and widely separated from each other and from the frontoparietals; upper part of ethmoid largely uncovered anteriorly. Omosternum entire.

Eggs as in *R. esculenta*.

Measurements, in millimètres, of type specimens.

		♂	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀
From snout to vent	..	80	74	74	74	70	66	102	102	100	98	90	85
Head	..	26	25	26	24	24	24	30	30	31	32	31	29
Width of head	..	26	25	26	24	24	25	33	33	34	34	33	31
Snout	..	9	9	9	8	9	8	11	11	12	12	10	10
Eye	..	10	9	9	9	9	8	11	11	12	12	11	10
Interorbital width	..	5	4	4	4	4	4	6	6	6	5	5	4
Tympanum	..	5	5	5	5	5	4	6	6	5	5	4.5	5
Fore limb	..	54	45	47	50	48	47	68	64	64	62	59	56
First finger	..	9	8	9	7	8	9	15	15	14	14	14	12
Second finger	..	9	8	9	7	8	9	14	14	14	13	13	11
Third finger	..	14	13	13	12	13	13	17	18	17	18	17	16
Fourth finger	..	9	8	9	7	7	8	11	13	12	13	12	11
Hind limb	..	137	123	132	124	126	122	180	167	176	167	166	150
Tibia	..	44	40	42	42	42	41	60	55	58	55	35	50

			♂	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀
Foot	..	..	43	38	42	39	39	38	56	54	56	55	54	48	48
Third toe	..	..	24	20	24	21	21	20	29	28	30	30	28	27	26
Fourth toe	..	..	36	32	35	36	32	30	46	45	46	47	43	41	40
Fifth toe	..	..	27	23	27	25	25	21	34	35	34	34	32	31	30

Habitat. Yunnan fu, Yunnan. Types in the British Museum.

This species is very similar to *R. andersonii*, Blgr., but readily distinguished by the absence of discs to the fingers and toes. It is truly a link between the subgenera *Rana* and *Hylorana*, and I cannot doubt that a direct genetic relationship exists between these two allied species; this remark applies also to *R. pleuraden* and *R. adenopleura*, and points to the polyphyletic origin of the subgenus *Hylorana*, which appears to be made up of specialized forms leading to scansorial types all derived from the *Ranae typicae*.

43. *Rana japonica*.

Rana temporaria (non Linn.), Schleg., *Faun. Japon.*, Rept. p. 109, pl. ii, fig. 2 (1838).

Rana temporaria, part., Middend., *Sibir. Reis.* II, p. 247, pl. xxvi, figs. 2—4 (1853); Dum. et Bibr., *Exp. Gén.* VIII, p. 358 (1841).

Rana temporaria, var. *japonica*, Günth., *Cat. Batr. Sal.* p. 17 (1858).

Rana silvatica, part., Hallow., *Proc. Ac. Philad.* 1860, p. 500; Günth., *Rept. Brit. Ind.* p. 409 (1864); Camerano, *Atti. Acc. Torin.* XIV, 1879, p. 876.

Rana middendorffii, Steenstr., *Vid. Meddel.* 1869, p. 18, fig.

Rana japonica, Bouleng., *Bull. Soc. Zool. France*, 1879, p. 190, and *Cat. Batr. Ecaud.* p. 47 (1882); Boettg., *Ber. Offenb. Ver. Nat.* 1888, p. 96; Bouleng., *Proc. Zool. Soc.* 1891, p. 610; Boettg., *Ber. Offenb. Ver. Nat.* 1895, p. 102; Werner, *Abh. Bay. Ak.* XXII, 1904, p. 358; Stejneger, *Herp. Jap.* p. 107, fig. (1907).

Rana japonica, var. *ornativentris*, Werner, *t. c.* p. 383.

Rana tsushimensis, Stejneger, *op. cit.* p. 116, fig.

Vomerine teeth in oblique groups or short series between the choanae or behind the level of their posterior borders.

Head rather depressed, as long as broad or a little longer or a little broader; snout rounded or more or less acuminate, more or less projecting beyond the mouth, as long as or little longer than the eye; canthus rostralis distinct; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout, or a little nearer the latter; distance between the nostrils equal to or a little greater than the interorbital width, which equals $\frac{2}{3}$ to $\frac{1}{2}$, rarely once, that of the upper eyelid and is usually less than the diameter of the tympanum; tympanum very distinct, $\frac{2}{3}$ to $\frac{1}{2}$ the diameter of the eye and 2 to 3 times its distance from the latter.

Fingers moderate or rather long, obtuse, first as long as or longer than the second, third longer than the snout; subarticular tubercles rather large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $5\frac{1}{2}$ times as long as broad, $1\frac{2}{3}$ to $2\frac{1}{2}$ times in length

from snout to vent, as long as or shorter than the fore limb or the foot. Toes obtuse or with the tips slightly swollen, $\frac{1}{2}$ to $\frac{3}{4}$ webbed, 2 or 3 phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the inner toe; outer tubercle absent or rather indistinct.

Skin of upper parts smooth or with small flat warts; a narrow glandular dorso-lateral fold from above the tympanum to the hip, parallel with its fellow or converging towards it behind the tympanum, the distance between the two folds $5\frac{1}{2}$ to 7 times in the length from snout to vent; a glandular fold from below the eye to above the arm; sometimes a Λ -shaped glandular ridge between the shoulders. Lower parts smooth, hinder half of thighs granulate.

Grey or yellowish brown to dark brown above, uniform or with darker spots; dorso-lateral folds often edged with dark brown on the outer side; sometimes a dark cross-bar between the eyes and a Λ -shaped dark marking between the shoulders; a dark brown or black streak from the end of the snout to the eye and a larger dark temporal spot, bordered below by a light streak which does not extend forward to beyond the eye; limbs with more or less numerous dark cross-bands, which may be very narrow, almost linear, or alternately broad and narrow. Lower parts white, uniform or more or less spotted or speckled with brown or grey, especially on the throat and breast.

Males without or with very small internal vocal sacs; fore limb very strong; a strong pad on the inner side of the first finger, covered, during the breeding season, with a spinulose greyish horny layer.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, which is uncovered and truncate in front; zygomatic process of squamosal short. Omosternum entire. Terminal phalanges slightly expanded at the end.

Tadpole with the tail ending in an obtuse point, 2 to $2\frac{1}{2}$ times the length of the body; beak broadly edged with black; 3 series of teeth on the upper lip and 4 on the lower, the outer upper and the 3 lower series uninterrupted.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
	♂	♂	♀	♀	♀	♀	♀	♀	♂	♀	♀	♂	♀	♂
From snout to vent..	52	48	65	60	43	68	59	48	36	41	50	64	58	40
Head ..	17	16	20	19	15	21	19	16	12	14	16	20	20	14
Width of head ..	15	15	20	18	14	22	19	16	12	13	16	20	20	14
Snout ..	6	6	6.5	6.5	6	7	6	6	4	5.5	5.5	7	7	5
Eye ..	5	5.5	6.5	6	5	7	6	6	4	5	5.5	6	6	5
Interorbital width ..	2.5	2.5	3	2.5	2	3	3	2	2	3	2.5	3.5	3	2
Tympanum ..	3.5	3.5	4	4	3	4	4	3.5	2.5	3	3.5	5	4	2
Fore limb ..	30	31	8	35	27	40	37	29	22	25	29	39	37	26
First finger ..	5.5	6	7	6	5	8	7	5.5	4	5	6	7	7	4.5
Second finger ..	4.5	5	6	5.5	4.5	7	6	5	4	4.5	5.5	6	6	4
Third finger ..	8	9	9.5	8	7.5	11	10	8	6	7	8.5	9	9	6

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
	♂	♂	♀	♀	♀	♀	♀	♀	♂	♀	♀	♂	♀	♂
Fourth finger	..	4	5.5	6	5	4.5	7	6	5	4	4	5	5	4
Hind limb	..	92	90	115	107	81	115	104	91	62	77	85	121	72
Tibia	30	29	37	34	25	36	33	29	20	25	27	38	22
Foot	30	30	37	34	27	38	35	29	21	25	27	36	24
Third toe	..	16	16	19	17	14	18	19	15	11	13	14	19	13
Fourth toe	..	24	24	30	28	20	29	27	25	18	20	23	30	20
Fifth toe	..	17	17	21	18	15	20	19	16	12	14	15	20	14

1—2. Yokohama. 3—4. Japan (types). 5. Yezo. 6—7. Tsu Shima (*R. tsushimensis*). 8. Ningpo. 9. Da Zu Valley, Chi Kiang. 10. Lushan Mts., Kiu Kiang. 11. Sze Chuen. 12—13. Yunnan fu. 14. Canton.

Habitat. Japan, Korea, China from Peking to Canton and Yunnan. The record from the Loo Choo Island requires confirmation.

R. japonica varies much in the shape of the head. Specimens from Tsu Shima (*R. tsushimensis*, Stejn.) have a short rounded snout, but the difference between them and typical specimens is, in this respect, not greater than between the extremes met with in the European *R. agilis* and *R. arvalis*; the difference is besides bridged over by specimens from Hondo and from China.

As this species is known to occur in Korea, it is very probable that the specimens with long and pointed snouts from S. F. Siberia noticed by Middendorff and for which the name *R. middendorffi* has been proposed by Steenstrup, belong to this species.

44. *Rana longicrus*.

Rana longicrus, Stejneger, *Journ. Sc. Coll. Tokyo*, XII, 1898, p. 216, and *Herp. Japan*, p. 104, fig. (1907).

Vomerine teeth in oblique groups between and projecting beyond the choanae, or entirely behind them.

Head longer than broad; snout pointed, feebly projecting beyond the mouth, longer than the eye; canthus rostralis distinct; loreal region feebly oblique; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the inter-orbital width, which equals or exceeds that of the upper eyelid or the diameter of the tympanum; tympanum very distinct; $\frac{3}{4}$ to $\frac{3}{2}$ the diameter of the eye and 2 to 3 times its distance from the latter.

Fingers long and slender, obtuse, first and second equal or first slightly the longer, third longer than the snout; subarticular tubercles moderate.

Hind limb very long and slender, about twice as long as head and body; tibio-tarsal articulation reaching beyond the tip of the snout; heels strongly overlapping when the limbs are folded at right angles to the body; tibia $5\frac{1}{2}$ to 6 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, as long as or longer than the fore limb, as long as or slightly shorter than the foot. Toes long and slender, obtuse or the tips slightly swollen, $\frac{1}{2}$ webbed, 3 phalanges of fourth and $1\frac{1}{2}$ or 2 of third and fifth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small; no tarsal fold; inner metatarsal tubercle

oval, very prominent, $\frac{1}{3}$ the length of the inner toe; outer tubercle barely indicated or absent.

Skin smooth, or with a few irregular tubercles on the sacrum; a narrow glandular dorso-lateral fold from above the tympanum to the hip, parallel with its fellow or converging towards it behind the tympanum, the distance between the two, on the back, $5\frac{1}{2}$ to $6\frac{1}{2}$ times in the length from snout to vent.

Pale brown above, uniform or with a dark bar between the eyes and small dark spots on the back and along the outer edge of the dorso-lateral fold; a dark brown streak from the tip of the snout to the eye and a large dark brown temporal spot with a light streak below it not extending beyond the eye; limbs with more or less distinct narrow dark cross-bars. Lower parts white.

Male unknown.

Measurements in millimetres.

				1. ♂	2. ♀	3. ♀
From snout to vent	..	..	..	50	37	50
Head	..	..	..	17	12	17
Width of head	..	..	..	15	10	16
Snout	..	..	..	6	5	7
Eye	..	..	..	5	4	5.5
Interorbital width	..	..	..	3	3	3.5
Tympanum	..	..	..	3	2.5	3.5
Fore limb	..	..	..	28	21	32
First finger	..	..	..	5.5	4.5	7
Second finger	..	..	..	5	4.5	6.5
Third finger	..	..	..	9	7.5	8.5
Fourth finger	..	..	..	5.5	5	5.5
Hind limb	..	..	..	95	74	98
Tibia	..	..	..	30	24	32
Foot	..	..	..	32	24	32
Third toe	..	..	..	16	13	19
Fourth toe	..	..	..	25	19	28
Fifth toe	..	..	..	18	13	20

1—2. Formosa? 3. Ching Fung Lin, Fokien, 1500 ft.

Habitat. Formosa¹ and China (Fokien).

Very closely allied to *R. japonica*. Distinguished by the narrower head, the less oblique loreal region and, usually, by the broader interorbital space and the longer, more slender limbs. I am not sure that the smaller specimen from Shanghai mentioned by Werner, Abh. Bayer. Ak. xxii. 1903, p. 358, does not belong to *R. longicrus* rather than to *R. japonica*.

45. *Rana lateralis*.

Rana lateralis, Bouleng., *Ann. Mus. Genova* (2) V, 1887, p. 483, pl. viii, fig. 2, and *Faun. Ind., Rept.* p. 457 (1890); Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1917, p. 266, pl.—, fig. 1.

¹ The type is from Taipa, Formosa. Two specimens, labelled China, Swinhoe, in the British Museum, are probably from Formosa, where R. Swinhoe made large collections.

Vomerine teeth in oblique series between the choanae, extending to or narrowly separated from the inner anterior corners of the latter.

Head rather strongly depressed, slightly longer than broad or slightly broader than long; snout obtusely pointed, projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye and 2 to 3 times its distance from the latter.

Fingers obtuse or with the tips slightly swollen, first longer than the second, third slightly longer than the snout; subarticular tubercles rather large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the anterior border of the eye, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, twice or a little more than twice in length from snout to vent, shorter than the fore limb, as long as or slightly shorter than the foot. Toes obtuse or with the tips slightly swollen, $\frac{1}{2}$ or $\frac{3}{4}$ webbed, 3 phalanges of fourth free; outer metatarsals separated in their distal $\frac{1}{2}$ or $\frac{3}{4}$; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle strongly compressed and very prominent, $\frac{2}{3}$ to $\frac{3}{4}$ the length of the inner toe; outer tubercle absent or very small and very indistinct.

Upper parts smooth or finely granulate; a narrow glandular dorso-lateral fold from above the tympanum to the hip and another from below the eye to the shoulder; the distance between the dorso-lateral folds, on the back, about $\frac{1}{2}$ the length from snout to vent; lower parts smooth.

Upper parts grey or bright crimson; sides of body sometimes black, the two colours sharply separated by the dorso-lateral fold; loreal region and temple black, separated from the grey or black upper lip by a white streak which sends up a process behind the tympanum; hind limbs with more or less distinct dark cross-bars; a more or less distinct dark band along the anterior side of the thigh; sometimes a dark band on each side of the belly. Lower parts white; males with the throat blackish with a whitish median line and the breast closely spotted with blackish.

Males with internal vocal sacs and a moderately large pad on the inner side of the first finger.

Nasal bones narrow, oblique, and widely separated from each other and from the frontoparietals.

The tadpole has been described by Malcolm Smith. Tail not quite twice as long as the body, obtusely pointed. Beak edged with black; two rows of long papillae on the lower lip; upper lip with a long continuous row of teeth and a second broadly interrupted by the beak; lower lip with 3 rows of teeth, the innermost usually narrowly interrupted.

Measurements in millimetres.

			1.	2.	3.	4.
			♂	♀	♀	♀
From snout to vent	..	..	47	55	49	48
Head	..	..	16	20	17	17
Width of head	..	..	17	19	16	16
Snout	..	..	6	6.5	6	6
Eye	..	..	6	6.5	6	6
Interorbital width	..	..	3	3	3	3
Tympanum	..	..	4	4	4	3.5
Fore limb	..	..	29	31	27	26
First finger	..	..	6	6.5	5.5	6
Second finger	..	..	4	5	4	4
Third finger	..	..	7	7	6.5	6.5
Fourth finger	..	..	4	4	4	3.5
Hind limb	..	..	75	85	77	72
Tibia	..	..	23	27	25	22
Foot	..	..	24	27	25	22
Third toe	..	..	12	14	13	11
Fourth toe	..	..	16	21	19	16
Fifth	..	..	11	13	12	11

1. Kokarit (Kawkareik) (type). 2—4. Lat Bur Kao, Siam.

Habitat. The types are from Tenasserim (Kokarit (Kawkareik), east of Moulmein); the species has since been rediscovered in Eastern and Central Siam.

Rana sanguineomaculata, Lesson, in Bélang. Voy. Ind. Or. p. 328, pl. v, fig. 2 (1832), from Bengal, only known from the very imperfect description and figure, is perhaps allied to *R. lateralis*. It is a frog with rather long snout, large tympanum, rather short and slender limbs, pointed fingers and toes, the latter $\frac{1}{2}$ webbed, and a glandular dorso-lateral fold. Pinkish grey above, with dark striation and vermiculation; sides of head blackish, with a white streak on the upper lip; limbs without cross-bands; large blood-red spots on the sides and lower surface of the body and on the limbs. From snout to vent 57 millim.

46. *Rana okinavana*.

Rana okinavana, Boettg., Zool. Ans. 1895, p. 266; and Ber. Offenb. Ver. Nat. 1895, p. 103; Stejneger, Herp. Japan, p. 102 (1907).

Vomerine teeth in rounded groups on a line with the posterior borders of the choanae and equally separated from them and from each other.

Snout anteriorly pointed and somewhat produced, as long as the eye; canthus rostralis distinct; loreal region slightly concave; nostril equidistant from the eye and from the tip of the snout; interorbital space as broad as the upper eyelid; tympanum very distinct, $\frac{2}{3}$ the size of the eye.

Fingers moderately long, tips truncate but without discs, first longer than second; subarticular tubercles well developed.

Tibio-tarsal reticulation reaching between the eye and the nostril; heels not overlapping; tibia $\frac{1}{2}$ length of head and body. Toes $\frac{2}{3}$ webbed, truncate like the fingers; inner metatarsal tubercle

oval, prominent, less than $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth above and beneath, with large flat warts on the sides; a narrow, very prominent, glandular dorso-lateral fold; another glandular fold from below the eye, ending above the shoulder in two round or oval glands.

Grey above, frequently with a fine, somewhat lighter vertebral line; a black blotch from the nostril through the eye to the temporal region; a blackish line bordering the upper lip and separated from the loreo-temporal blotch by a pure white streak which ends on the glands above the insertion of the arm; tympanum brown; dorso-lateral fold externally edged with black, the sides often entirely blackish; hind limbs with dark cross-bands. Lower parts yellowish white, spotted and dotted very densely with blackish, the throat usually entirely blackish.

Male unknown.

From snout to vent 46 millim.

Habitat. Okinawa, Loo Choo Islands.

This species, known to me from the descriptions only, is stated to be allied to *R. labialis*.

47. *Rana malabarica*.

Rana malabarica (Bibr.), Tschudi, *Class Batr.* pp. 40 and 80 (1838); Dum. et Bibr., *Erp. Gén.* VIII, p. 635, pl. lxxvi, fig. 1 (1841); Bouleng., *Cat. Batr. Ecaud.* p. 60 (1882), and *Faun. Ind., Rept.* p. 456 (1890); Boettg., *Ber. Offenb. Ver. Nat.* 1892, 95.
Hylorana malabarica, Günth., *Rept. Brit. Ind.* p. 426 (1864); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 105.

Vomerine teeth in oblique groups or short series between the choanae, nearer to each other than to the latter.

Head rather strongly depressed, as long as broad; snout rounded or obtusely pointed, moderately projecting, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril a little nearer the end of the snout than the eye; the distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to once the diameter of the eye, close to it or separated from it by a space not exceeding $\frac{1}{3}$ its diameter.

Fingers a little swollen at the end, first longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb rather short or moderately long, the tibio-tarsal articulation reaching the tympanum or the eye, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ to 4 times as long as broad, 2 to $2\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb, as long as or slightly longer than the foot. Toes rather short, slightly swollen at the end, $\frac{1}{2}$ to $\frac{3}{4}$ webbed, 2 or 3 phalanges of fourth free, the outer metatarsals separated in their distal half; subarticular tubercles

rather large, very prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the inner toe; a rather large, round, very prominent outer tubercle.

Skin smooth or granulate above, with small warts on the sides; a broad but feebly prominent and ill-defined glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the dorso-lateral folds on the back $\frac{1}{3}$ to $\frac{1}{2}$ the length of head and body; another glandular fold, followed by a large gland, below the tympanum. Lower parts smooth, or granulate on the posterior part of the belly and under the thighs.

Crimson above, with or without a few small black spots, dark brown or black with more or less numerous white spots or with a white or yellow lateral streak on the sides, the limit between the crimson and the black very sharply defined, if not accompanied by a white line, and corresponding to the inner edge of the dorso-lateral fold and to the canthus rostralis; tympanum often reddish brown; a white streak on the upper lip, terminating with the glandular fold behind the mouth, sometimes continuous with the light streak on the side of the body; limbs pale brown, with more or less distinct dark brown or black cross-bands or spotted and marbled with dark brown or black; hinder side of thighs black, with white or yellow spots. Lower parts white or yellow, uniform or spotted or marbled with dark brown, or throat and breast dark brown.

Males with rather feebly developed external vocal sacs, forming folds on the side of the throat, below the temporal region; an ill-defined flat gland on the anterior side of the arm; a feeble pad on the inner side of the first finger, covered with a velvet-like greyish horny layer.

Tadpoles from Talewadi, collected by Mr. Kemp and identified as of this species by Dr. Annandale, are remarkable for their large size (total length 70 millim.) and black colour above and beneath. Tail pointed, $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as the body, the crest not extending on to the back. Buccal disc more than half the width of the body, with numerous papillae on the sides, the upper edges toothed, the lower with a single series of small round papillae; horny teeth in 8 upper series, the 2 outer continuous, the others gradually decreasing in length, and 6 or 7 lower series, the innermost narrowly interrupted, the others continuous; beak white, broadly edged with black.

Nasal bones small, oblique, separated from each other and from the ethmoid, which is exposed and truncate in front; fronto-parietals broad and flat; zygomatic branch of the squamosal not longer than the posterior. Omosternal style forked at the base. Terminal phalanges feebly expanded at the end.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10	11	12.	13.	14.	15.
From snout to vent	♀	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂
Head	40	59	61	59	58	55	51	48	46	70	66	70	45	40	65
	13	19	20	19	19	19	18	16	16	22	22	22	15	13	21

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
	♀	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂
Width of head ..	13	19	20	19	19	19	18	16	16	21	22	22	15	13	21
Snout ..	5	7	7	7	7	7	7	6	6	9	9	8	6	5	8
Eye ..	5	7	6	6	7	7	6	6	6	7	7	8	6	6	7
Interorbital width ..	3	4	3'5	3'5	4	3'5	3	3	3	6	5	4	3'5	3	5
Tympanum ..	4	6	6	5	5	5	5	5	5	6	6	6	4'5	4	7
Fore limb ..	27	36	40	36	35	36	33	30	29	41	41	41	30	26	42
First finger ..	5'8	8	8	8	8	8	7	6	6	10	9	8	6	5'5	10
Second finger ..	4'5	7	7	7	7	7	6	5	5	9	8	7	5	4'5	9
Third finger ..	7'5	10	10	10	10	10	9	8	8	12	12	10	8	7'5	12
Fourth finger ..	4'5	7	7	7	7	7	6	5	5	8	8	7	5	4'5	8
Hind limb ..	64	86	89	83	81	84	76	68	70	102	98	93	70	63	95
Tibia ..	20	27	29	27	27	27	25	21	21	33	30	30	21	20	32
Foot ..	20	26	29	27	27	26	24	22	21	31	30	29	21	20	31
Third toe ..	9	13	14	13	13	13	12	11	11	15	15	13	11	9	16
Fourth toe ..	15	19	21	20	20	19	18	17	17	25	25	20	17	15	23
Fifth toe ..	9	13	14	12	13	12	12	11	11	17	16	13	10	9	16

1. Matheran, Bombay. 2. Canara. 3—9. Cannanore, Malabar. 10—11. Malabar (Paris Museum, types). 12—14 Malabar. 15. Goa (Indian Museum).

Habitat. Western India, from Bombay to Malabar.

[This frog is by no means confined to hilly country, though most abundant at the base of hill-ranges. It does not ascend to high altitudes. I have not seen it on the Nilgiri plateau, but it breeds in streams running into the gorge of the Bhavani River at the base of the Nilgiris. The tadpoles live in the stiller pools of small rocky streams in fairly level ground but as a rule shaded by dense jungle. *N.A.*]

This species, together with the African *R. galamensis*, D. and B., which is very closely allied to it, occupies an isolated position in the subgenus *Rana*. The forked condition of the omosternum precludes our considering them as links between *Rana* and *Hylorana*.

Subgenus *Tomopterna*.

Dum. et Bibr., *Erp. Gén*, VIII, p. 443 (1841).

Vomerine teeth in small groups or short series between or just behind the choanae. Fingers and toes not dilated at the tip; outer metatarsals bound together or separated in the distal third or fourth only. Zygomatic branch of the squamosal very short. Precoracoids strong, straight; omosternal style forked at the base in the Indian species. Terminal phalanges obtuse.

Burrowing, more or less toad-like forms, with large head and compressed inner metatarsal tubercle, clearly derived from the group embracing *Rana tigrina* and *R. limnocharis*.

SYNOPSIS OF THE SPECIES.

I. First finger longer than second; tympanum $\frac{3}{4}$ to $\frac{3}{2}$ diameter of eye.

Snout as long as or a little shorter than eye; first finger a little longer than second, much shorter than third; tibio-tarsal articulation reaching tympanum or posterior border of eye; tibia 3 to $3\frac{1}{2}$ times as long as broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent; toes $\frac{1}{4}$ to $\frac{1}{2}$ webbed; outer metatarsals separated in the distal third or fourth; inner metatarsal

- tubercle $\frac{3}{4}$ to $\frac{5}{8}$ length of inner toe; a small outer metatarsal tubercle ... *R. rufescens*, Jerd.
- Snout shorter than eye; first finger much longer than second, as long as or a little shorter than third; tibio-tarsal articulation reaching axil or shoulder; tibia 2 to 3 times as long as broad, $2\frac{3}{4}$ to 3 times in length from snout to vent; toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed; outer metatarsals united; inner metatarsal tubercle longer than inner toe; no outer tubercle ... *R. breviceps*, Schn.
- Snout as long as eye; first finger much longer than second, as long as third; tibio-tarsal articulation reaching shoulder; tibia 3 times as long as broad, $2\frac{3}{4}$ to $2\frac{5}{8}$ times in length from snout to vent; toes with a mere rudiment of web; outer metatarsals united; inner metatarsal tubercle longer than inner toe; no outer tubercle ... *R. dobsoni*, Blgr.
- II. First and second fingers equal; tympanum as large as eye; toes $\frac{1}{2}$ webbed; an outer metatarsal tubercle ... *R. strachani*, Murr.

48. *Rana rufescens*.

Pyxicephalus rufescens, Jerdon, *Journ. As. Soc. Beng.* XXII, 1854, p. 534; Günth., *Rept. Brit. Ind.* p. 412 (1864).

Rana rufescens, Bouleng., *Cat. Batr. Ecaud.*, p. 29 (1882), and *Faun. Ind., Rept.* p. 451 (1890).

Vomerine teeth in oblique series between and extending posteriorly a little beyond the choanae.

Head a little broader than long, feebly depressed; snout rounded, as long as or a little shorter than the eye, scarcely projecting beyond the mouth; canthus rostralis very obtuse; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum very distinct, about $\frac{1}{2}$ the diameter of the eye and about twice its distance from the latter.

Fingers obtusely pointed, first much longer than the second, third not or but slightly longer than the first, as long as the snout; subarticular tubercles well developed and very prominent.

Hind limb rather short, the tibio-tarsal articulation reaching the tympanum or the posterior border of the eye, the heels feebly overlapping when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, $2\frac{3}{4}$ to $2\frac{1}{2}$ times in length from snout to vent, a little shorter than the foot, shorter than the fore limb. Toes obtusely pointed, $\frac{1}{2}$ or $\frac{3}{4}$ webbed; outer metatarsals narrowly separated in the distal third or fourth only; subarticular tubercles rather small, but very prominent; no tarsal fold; inner metatarsal tubercle large, very prominent, compressed, $\frac{3}{4}$ to $\frac{5}{8}$ the length of the inner toe; a small outer metatarsal tubercle.

Upper surface of head and body with very prominent warts of unequal size. Sometimes with two short glandular ridges forming a Λ between the shoulders; a strong glandular fold from the eye to the shoulder; a more or less distinct fold across the head, behind the eyes. Lower parts smooth.

Greyish brown above, with more or less distinct darker spots or marblings; often a dark cross-bar between the eyes and a **A**-or **W**-shaped marking between the shoulders; dark vertical bars on the lips, two of which extend to the eye; limbs with dark cross-bands. Lower parts white, throat spotted with brown.

Males with a vocal sac on each side, forming folds on the throat, which bears a **M**-shaped black marking; fore limb very robust; a strong pad on the inner side of the first finger.

Nasal bones large, in contact with each other and with the fronto-parietals, which are narrow and flat; ethmoid not exposed; zygomatic process of squamosal short. Omosternal style forked at the base. Terminal phalanges obtusely pointed.

Measurements in millimetres.

			♂	♂	♂	♂	♀	♀
From snout to vent	..	..	35	34	33	32	34	33
Head ..	..	..	11	11	11	11	11	11
Width of head	..	..	12	12	12	12	12	12
Snout	..	..	3.5	4	4	4	4	4
Eye ..	..	..	4.5	4	4	4	4	4
Interorbital width	..	..	1.5	2	1.5	1.5	2	2
Tympanum	..	..	2	2	2.5	2	2	2
Fore limb	..	..	18	18	19	19	18	19
First finger	..	..	4	3.5	3.5	3.5	4	3.5
Second finger	..	..	2	2	2	2	2	2
Third finger	..	..	4	4	4	4	4	4
Fourth finger	..	..	2	2	2	2	2	2
Hind limb	..	..	48	50	47	48	50	51
Tibia ..	..	..	14	15	14	14	15	15
Foot ..	..	..	15	16	15	15	16	16
Third toe	..	..	7	8	7	7	8	8
Fourth toe	..	..	11	12	11	11	12	12
Fifth toe	..	..	5	6	6	6	6	6

Habitat. Malabar.

Connects *Rana* with *Tomopterna*.

49. *Rana breviceps*.

Rana breviceps, Schneid., *Hist. Amph.* 1, p. 140 (1799); Peters, *Mon. Berl. Ac.* 1863, p. 76; Boulenger., *Cat. Batr. Ecaud.* p. 32 (1882), and *Faun. Ind.*, *Rept.* p. 451 (1890); Ferguson, *Journ. Bomb. N.H. Soc.* XV, 1904, p. 502, pl. B, fig. 1.

Rana variegata, Gravenh. *Delic. Mus. Vratisl.* p. 33, pl. viii, fig. 1 (1829).

Pyxicephalus fodiens, Jerd., *Journ. As. Soc. Beng.* XXII, 1853, p. 534.

Pyxicephalus pluvialis, Jerd., *l.c.*

Sphaerotheca strigata, Günth., *Cat. Batr. Sal.* p. 32, pl. ii, fig. A (1858).

Tomopterna delalandii, part., Günth., *op. cit.* p. 129.

Tomopterna strigata, Günth., *Proc. Zool. Soc.* 1860, p. 165.

Pyxicephalus breviceps, Günth., *Rept. Brit. Ind.* p. 411 (1864); Theob., *Cat. Rept. As. Soc. Mus.* p. 80 (1868); Anders., *Proc. Zool. Soc.* 1871, p. 200; Murray, *Zool. Sind.* p. 399 (1884).

Vomerine teeth in strong, short oblique series between the choanae or extending a little beyond the level of their posterior borders.

Habit stout, toad-like.

Head convex, broader than long; snout rounded, not projecting, shorter than the eye; canthus rostralis very obtuse; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout, or nearer the former; distance between the nostrils equal to or a little greater than the inter-orbital width, which is $\frac{1}{2}$ to $\frac{3}{4}$ that of the upper eyelid; tympanum distinct, $\frac{1}{3}$ to $\frac{2}{3}$ the diameter of the eye, 2 to 3 times its distance from the latter.

Fingers rather short, obtuse, first much longer than the second, as long as or a little shorter than the third, which is longer than the snout; subarticular tubercles large and very prominent or subconical.

Hind limb very short, the tibio-tarsal articulation reaching the axil or the shoulder, the heels separated or just meeting when the limbs are folded at right angles to the body; tibia 2 to 3 times as long as broad, $2\frac{2}{3}$ to 3 times in length from snout to vent, much shorter than the fore limb, shorter than the foot. Toes rather short, obtuse, $\frac{1}{4}$ to $\frac{1}{2}$ webbed; outer metatarsals united; subarticular tubercles small, prominent; no tarsal fold; inner metatarsal tubercle large, strongly compressed, inserted obliquely at the base of the first toe, which it considerably exceeds in length; no outer tubercle.

Skin smooth or granulate above, sometimes with elongate warts or interrupted longitudinal glandular folds along the back; a more or less distinct curved fold from the eye to the shoulder. Belly and lower surface of thighs granulate.

Brown or yellowish above, with dark brown spots or marblings, the spots sometimes disposed with great symmetry; a yellow vertebral streak or broad band often present; often a yellowish band from the upper eyelid to the groin; usually a dark canthal streak and dark vertical bars on the upper lip; limbs usually with irregular dark cross-bands, groin and hinder side of thighs dark brown with yellow spots, or marbled dark brown and yellow. Lower parts white, throat sometimes with brown spots.

Males with a vocal sac forming folds on the sides of the throat, which are black or blackish.

Nasal bones rather small, separated from each other and from the frontoparietals; ethmoid largely exposed above, produced forward beyond the nasals. Omosternal style forked at the base. Terminal phalanges obtuse.

The tadpole, described and figured by Ferguson, and of which I have examined two specimens, is not unlike that of *R. limnocharis*. Beak edged with black, lower mandible finely serrated; horny labial teeth in a long marginal upper series followed by an interrupted inner series, and in 3 uninterrupted lower series, the outermost very short; fleshy papillae on the sides of the lip.

Eggs 1 millim. in diameter.

Measurements in millimetres.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	♂	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♀	♀	♀	♀	♀
From snout to vent	50	45	56	50	47	42	55	51	44	37	55	35	45	40	38	37	53
Head ..	18	17	18	17	17	15	15	18	15	13	18	13	16	14	14	14	17
Width of head ..	21	20	21	20	19	17	21	21	17	16	22	15	18	15	16	16	21
Snout ..	5	5	5	5	4	4	5	5	4	3.5	5	3	4	3	3	3	5
Eye ..	7	6	7	6	6	5.5	7	7	6	5	7	5	6	5	5	5	7
Interorbital width	2.5	2	2.5	2	2	2	2	2.5	2.5	2	2.5	2	2.5	2.5	2.5	2	2.5
Tympanum ..	4	3	4	3	3	2.5	4	3	3	2.5	4	2.5	3	2	2	2	3
Fore limb ..	29	27	32	26	25	24	29	28	24	21	29	19	26	20	22	20	30
First finger ..	7	6	8	6	6	6	7	7	5.5	4	7	4	6	5	5	5	7
Second finger ..	4	3.5	5	4	4	4.5	4	4	4	3	4	3	4	3.5	4	3.5	4
Third finger ..	7	6	8	7	7	6.5	7	7	6	5	7	5	6	5	6	5	7
Fourth finger ..	3	3	4	3	3	3	3	3	2.5	2.5	3.5	2	3	2	2	2.5	3
Hind limb ..	61	55	62	60	57	53	61	63	52	45	63	40	54	46	47	46	62
Tibia ..	19	17	19	17	17	16	18	18	15	13	19	12	15	14	14	14	18
Foot ..	22	20	24	23	22	20	22	22	19	17	23	15	18	17	17	17	21
Third toe ..	9	8	9	8	8	8	9	9	7	6	8	5	7	6	6	6	8
Fourth toe ..	12	12	14	13	13	12	13	13	12	9	13	8	11	9	9	9	12
Fifth toe ..	5	4.5	5	4	4	4	5	5	3	3	5	2.5	4	3	4	3	5
First toe ..	3	2.5	3	3	3	3	3	3	3	2.5	3	2	2.5	2.5	2.5	2	3
Inner met. tubercle	5	4	5	5	5	4.5	5	5	4	4	5	3	4	3.5	4	3.5	4

1. Simla. 2-6. Madras (types of *Sphaerotheca strigata*). 7-8. Malabar.
9-10. Trevandrum, Travancore. 11. Trincomalee, Ceylon. 12-16. Ceylon.
17. North Chin Hills, Upper Burma.

Habitat. India, Ceylon, and Upper Burma. Restricted to the plains in Southern India.

50. *Rana dobsonii*.

Rana dobsonii, Bouleng., *Cat. Batr. Ecaud.* p. 32, pl. iii, fig. 1 (1882), and
Faun. Ind., Rept. p. 452 (1890).

Vomerine teeth in strong, short oblique series between the choanae, nearer to each other than to the latter.

Habit stout, toad-like.

Head convex, broader than long; snout rounded, not projecting, as long as the eye; canthus rostralis obtuse; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the interorbital width, which is $\frac{2}{3}$ that of the upper eyelid; tympanum distinct, vertically oval, about $\frac{2}{3}$ the diameter of the eye.

Fingers rather short, obtuse, first much longer than the second, as long as the third, which is a little longer than the snout; subarticular tubercles very large, very prominent.

Hind limb very short, the tibio-tarsal articulation reaching the shoulder, the heels meeting when the limbs are folded at right angles to the body; tibia 3 times as long as broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent, much shorter than the fore limb, a little shorter than the foot. Toes rather short, obtuse, with a slight rudiment of web; outer metatarsals united; subarticular tubercles small, prominent; no tarsal fold; inner metatarsal tubercle large, strongly compressed, inserted obliquely at the

base of the first toe, which it considerably exceeds in length ; no outer tubercle.

Skin finely granulate above ; a strong curved glandular fold from the eye to the shoulder. Belly and lower surface of thighs granulate.

Grey above, uniform or indistinctly marbled with dark brown ; a fine yellow vertebral line sometimes present ; a deep black streak from the tip of the snout, through the nostril and the eye, to the shoulder, expanding in a round spot on the tympanum ; limbs without or with very indistinct darker cross-bands ; groin marbled with black ; upper surface of thighs black, spotted or marbled with white. Lower parts white, throat spotted with brown.

Male unknown.

Nasal bones separated from each other and from the fronto-parietals.

Measurements in millimetres.

		1.	2.
		♀	♀
From snout to vent	..	55	57
Head	.. ..	19	20
Width of head	.. ..	22	23
Snout	.. ..	7	7
Eye	.. ..	7	7
Interorbital width	.. ..	3	3
Tympanum	.. ..	4.5	5
Fore limb	.. ..	34	35
First finger	.. ..	8	8
Second finger	.. ..	5	5
Third finger	.. ..	8	8
Fourth finger	.. ..	4	4
Hind limb	.. ..	69	67
Tibia	.. ..	20	20
Foot	.. ..	22	22
Third toe	.. ..	8	7
Fourth toe	.. ..	13	13
Fifth toe	.. ..	5	5
First toe	.. ..	3	3
Inner metatarsal tubercle	.. ..	4	5

1. Mangalore (type). 2. S. Canara.

Habitat. Malabar.

51. *Rana strachani*.

Tomopterna strachani, Murray, *Zool. Sind*, p. 399 (1884).

Rana strachani, Bouleng., *Faun. Ind., Rept.* p. 452 (1890).

This species being unknown to me, I merely reproduce the original description.

“Muzzle very little longer than broad. Snout obtuse. Tympanum distinct, circular, as large as the eye. Crown flattish. Lower jaw with weak bony prominences. Skin of back with short longitudinal folds ; a fold on each side of the abdomen, and another across the under surface of the body, immediately behind the fore limbs. A plait behind the tympanum, coming down to the shoulder. Fingers quite free, swollen at the tips ; laid beside each other, the first, second, and fourth fingers are of

equal length. Hind limb longer than the head and body; laid beside the body, the metatarsal tubercle reaches the end of the snout. Metatarsus with a sharp-edged spur on the inner side and a tubercle on the outer. Toes half-webbed, the tips slightly swollen, and each of the joints on the under surface with a tubercle. Third toe slightly longer than the fifth, fourth the longest. Colour greyish, with a rufescent tinge. A dark brown subtriangular spot on the occiput, extending from across and behind the eyelids, immediately following which is a filiform white vertebral streak, extending to the vent; back with six irregular-shaped dark brown spots. Plait behind the tympanum reddish brown. Fore and hind limbs externally with transverse bars of the same colour. Upper and lower jaws with vertical bars of reddish brown. Chin, throat, and rest of under surface white."

Habitat. Malir, near Kurrachi (Karachi), Sind.

Subgenus *Nanorana*.

Günth., *Ann. Mus. Zool. St. Pétersb.* I, 1896, p. 207.

Vomerine teeth, if present, much reduced. No tympanum, no stapes. Fingers and toes not dilated at the tips; outer metatarsals separated by web in their distal third or fourth only. Zygomatic branch of the squamosal short. Omosternal style not forked at the base. Terminal phalanges obtuse.

I regard the single species of this subgenus as a dwarfed, degraded form derived from the *R. liebighii* group, with which it is connected to a certain extent by *R. blanfordii*.

52. *Rana pleskei*.

Nanorana pleskei, Günth., *Ann. Mus. Zool. St. Pétersb.* I, 1896, p. 207; Bedriaga, *Wiss. Res. Przewalski Reis.*, Zool. III, i, p. 32, pl. i, fig. 5. (1898).

Rana pleskei, Bouleng., *Am. and Mag. N.H.* (7) XV, 1905, p. 378; Annand., *Rec. Ind. Mus.* II, 1908, p. 345, and XIII, 1917, p. 417, fig.

Vomerine teeth absent or reduced to small oblique groups behind the level of the choanae.

Head a little broader than long, rather strongly depressed; snout rounded, scarcely projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis very obtuse; loreal region very oblique, concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; no tympanum.

Fingers obtuse, first as long as or slightly shorter than the second, third as long as or longer than the snout; a single, feebly prominent subarticular tubercle at the base of each finger.

Hind limb rather short, the tibio-tarsal articulation reaching the shoulder or the temple, the heels just meeting when the limbs are folded at right angles to the body; tibia 3 times as long as

broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent, considerably shorter than the foot or the fore limb. Toes obtusely pointed, entirely or nearly entirely webbed, the distal phalanx of the fourth often free; outer metatarsals separated by web only in their distal third or fourth; subarticular tubercles small and very feebly prominent; no tarsal fold; inner metatarsal tubercle small, oval, about $\frac{1}{3}$ the length of the inner toe; no outer metatarsal tubercle.

Upper parts with small elongate smooth warts, which often form regular longitudinal series or interrupted folds on the back; a glandular fold from the eye to the shoulder; lower parts smooth.

Olive above, uniform or with numerous small blackish spots which may have a light centre; a yellow vertebral streak sometimes present; a blackish streak from the tip of the snout to the shoulder, passing through the eye; limbs with dark spots but no cross-bars. Lower parts white, uniform or spotted with blackish.

Males without secondary sexual characters.

Nasal bones rather small, in contact with each other; frontoparietals not meeting on the median line; a small part of the ethmoid uncovered. Pectoral arch as in *R. temporaria*.

Eggs large, 2 millim. in diameter in uterus of female measuring 54 mm. from snout to vent.

Measurements in millimetres.

	1	2	3	4	5	6	7	8	9	10
	♂	♂	♀	♀	♂	♂	♀	♀	♀	♀
From snout to vent	..	34	31	53	40	41	35	54	47	58
Head	11	10	15	13	13	12	16	15	16
Width of head	12	11	18	14	14	13	18	17	19
Snout	4	4	5	4.5	4.5	4.5	6	5	5
Eye	4	4	6	4.5	4.5	4.5	6	5	6
Interorbital width	2	2	2.5	2	2	2	2.5	2	2
Fore limb	17	16	27	21	24	20	29	27	32
First finger	3.5	3	5	3.5	5	3.5	5	4.5	5.5
Second finger	4	3.5	5	4	5.5	3.5	5	4.5	5.5
Third finger	5	4	6	5	6	5	6	6	7
Fourth finger	3.5	3	4	4	3.5	3	4.5	4	5
Hind limb	41	39	68	52	55	48	69	65	80
Tibia	13	12	19	16	17	13	20	18	22
Foot	15	14	23	18	19	16	24	21	29
Third toe	8	6	11	9	10	8	12	11	14
Fourth toe	10	9	15	11	12	10	16	15	19
Fifth toe	7	7	10	8	8	7	10	10	14

1—4. L. Yamdok, 15,000 f. 5—8. Kamba Jong. 9—10. Gyangtse.

Habitat. Tibet, up to 15,000 feet; Kashmir between 9000 and 1200 ft.

A very aberrant species.

According to Annandale, the tadpole reaches a large size,—72 millim., in which the tail enters for .45. The tail is round at the end. Lips moderately developed with a fringe of papillae which is only narrowly interrupted in the middle of the upper lip; beak serrated at the edge, the upper mandible bearing a couple of long narrow cusps at either end; 4 upper and 5 lower series of labial teeth, only the outermost uninterrupted; these series of teeth

are supported by thick fleshy ridges. But for the shape of the beak, the mouth-structure of this tadpole is very suggestive of that of the European *Pelobates*.

Since the above was written, Dr. Annandale has submitted to me two specimens of a toad¹ from Srinagar, Kashmir, sent to him by Mr. F. J. M. Mitchell as representing the adult of the tadpole assigned by him to *Rana pleskii*. I have no doubt this suggestion is correct, and as the toads belong to *Aelurophryne mammata*, Gthr., the resemblance of the tadpole to that of *Pelobates* is accounted for.

Subgenus *Discodeles*.

Bouleng., *Ann. and Mag. N.H.* (9) I, 1918, p. 238.

Tips of toes, and usually of fingers, dilated into discs, the upper surface of which is separated from the lower by a crescentic or horseshoe-shaped groove; web not penetrating or not penetrating far between the outer metatarsals. Vomerine teeth in transverse or oblique series behind the choanae or on a level with the posterior borders of the latter. Tongue with a large, retractile papilla in the middle. Glandular dorso-lateral fold, if present, not confluent with the temporal. Nasal bones large, in contact with each other and with the frontoparietals. Omosternal style forked at the base.

Connected with *Rana*, s. str., through *R. grunniens*. The genera *Cornufer* and *Platymantis* are evidently derived from this group.²

SYNOPSIS OF THE SPECIES.

- I. Discs of toes longer than broad; first finger at least as long as second; toes $\frac{3}{4}$ to entirely webbed; lingual papilla obtuse; terminal phalanges feebly expanded at the end.

Vomerine teeth not extending outwards beyond vertical of inner edges of choanae; tympanum about $\frac{1}{3}$ diameter of eye; fingers without discs; tibio-tarsal articulation reaching temple; tibia $2\frac{1}{4}$ to $2\frac{3}{4}$ times as long as broad; upper parts very warty, with an interrupted glandular dorso-lateral fold; belly granulate

... *R. bufoniformis*, Blgr.

Vomerine teeth not extending outwards beyond vertical of inner edges of choanae; tympanum $\frac{2}{3}$ to $\frac{1}{2}$ diameter of eye; fingers without discs; tibio-tarsal articulation reaching eye; tibia 3 to $3\frac{1}{2}$ times as long as broad; upper parts smooth or warty; belly feebly granulate; male with internal vocal sacs

... *R. opisthodon*, Blgr.

Vomerine teeth extending outwards beyond vertical of inner edges of choanae; tympanum $\frac{1}{2}$ to $\frac{1}{3}$ diameter of eye; tips of fingers dilated into distinct discs; tibio-tarsal articulation reaching eye or tip of snout; tibia 3 to $3\frac{1}{2}$ times as long as broad; skin smooth or feebly warty above, with or without an indication of an interrupted dorso-lateral fold, smooth beneath; male with external vocal sacs

... *R. guppyi*, Blgr.

- II. Discs of fingers and toes broader than long; lingual papilla long and pointed; male without vocal sacs; terminal phalanges T-shaped or Y-shaped.

¹ Cf. Boulenger, *Rec. Ind. Mus.* XVI, p. 470 (1919).

² Cf. Boulenger, *Ann. and Mag. N.H.* (9) I, 1918, p. 372.

- A. Toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed, tibia 4 to $4\frac{1}{2}$ times as long as broad.
 Toes $\frac{3}{4}$ webbed, the web reaching discs of third and fifth ;
 first finger at least as long as second ; tympanum $\frac{1}{2}$
 to $\frac{3}{4}$ diameter of eye ... *R. beddomii*, Gthr.
 Toes $\frac{3}{4}$ webbed, the web reaching discs of third and fifth ;
 first finger shorter than second ; tympanum $\frac{3}{4}$ dia-
 meter of eye ... *R. leithii*, Blgr.
 Toes $\frac{1}{2}$ webbed, 2 phalanges of third and fifth free ; first
 finger longer than second ; tympanum nearly as large
 as eye and close to it ... *R. semipalmata*, Blgr.
 B. Toes not more than $\frac{1}{2}$ webbed, the web not or scarcely penetrating between
 outer metatarsals ; first finger shorter than second ; tympanum $\frac{1}{2}$ to $\frac{3}{4}$ dia-
 meter of eye.
 Tympanum very distinct ; loreal region very oblique ;
 tibia 4 to 5 times as long as broad ; skin of head
 smooth, of back with short longitudinal folds ... *R. leptodactyla*, Blgr.
 Tympanum very distinct ; loreal region feebly oblique ;
 tibia $3\frac{1}{2}$ to 4 times as long as broad ; skin of head
 smooth, of back with short longitudinal folds ... *R. diplosticta*, Gthr.
 Tympanum moderately distinct ; tibia 4 times as long
 as broad ; head and back with large warts ... *R. phrynoderma*, Blgr.

The first group (species 53 to 55) may be designated as *Ranae guppianae*, the second (species 56 to 61) as *Ranae beddomianae*.

53. *Rana bufoniformis*.

Rana bufoniformis, Bouleng., *Proc. Zool. Soc.* 1884, p. 210, *Tr. Zool. Soc.* XII, 1886, p. 47, pl. viii, and *Ann. and Mag. N.H.* (9) I, 1918, p. 239.

Vomerine teeth in short and strong oblique series behind the choanae, not extending outwards beyond the vertical of the inner edges of the latter, the space between the two series equal to the length of one of them. Tongue with an obtuse papilla in the middle.

Habit very stout. Head large, much depressed, much broader than long ; snout rounded, feebly projecting beyond the mouth, as long as or slightly longer than the eye ; canthus rostralis obtuse ; loreal region very oblique, feebly concave ; nostril nearer the tip of the snout than the eye ; distance between the nostrils less than the interorbital width, which equals that of the upper eyelid ; tympanum distinct, about $\frac{1}{2}$ the diameter of the eye and $\frac{1}{2}$ to $\frac{3}{4}$ its distance from the latter.

Fingers rather short and thick, with slightly swollen tips, first longer than the second, third nearly as long as the snout ; sub-articular tubercles large, prominent.

Hind limb short ; the tibio-tarsal articulation reaches the temple, the heels meet or fail to meet when the limbs are folded at right angles to the body ; tibia $2\frac{1}{4}$ to $2\frac{3}{4}$ times as long as broad, about $2\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb, slightly shorter than the foot. Toes short, the tips dilated into small discs with a groove separating the upper from the lower surface, $\frac{3}{4}$ webbed, 2 phalanges of fourth free ; the web not penetrating very far between the outer metatarsals ; sub-articular tubercles large and oval, very prominent ; no tarsal fold ;

inner metatarsal tubercle oval, flat, $\frac{1}{2}$ the length of the inner toe; a rather larger but rather indistinct roundish outer metatarsal tubercle.

Head, body, and hind limbs rough with small warts, the largest of which, on the body, are round and studded with minute horny spinules; larger warts form an interrupted dorso-lateral fold; a strong glandular fold above the tympanum. Lower parts smooth, except the belly and the thighs, which are feebly granulate.

Uniform purplish brown above, yellowish beneath.

Male unknown.

Nasal bones large and in contact with each other and with the frontoparietals, which entirely cover the ethmoid above. Terminal phalanges with feeble transverse distal expansion.

Measurements in millimetres.

				1. ♀	2. ♀
From snout to vent	..	..	..	145	150
Head	..	..	..	55	53
Width of head	..	..	..	70	70
Snout	..	..	..	17	21
Eye	..	..	..	17	19
Interorbital width	..	..	..	15	15
Tympanum	..	..	..	5	6
Fore limb	..	..	..	85	87
First finger	..	..	..	16	18
Second finger	..	..	..	15	16
Third finger	..	..	..	19	20
Fourth finger	..	..	..	14	15
Hind limb	..	..	..	185	195
Tibia	..	..	..	58	61
Foot	..	..	..	60	65
Third toe	..	..	..	30	32
Fourth toe	..	..	..	41	43
Fifth toe	..	..	..	24	25

1. Treasury Id. (type). 2. Faro Id.

Habitat. Solomon Islands; the type is from Treasury Id., a second specimen from Faro Id.

One of the most toad-like species of the genus, its form contrasting strikingly with that of the allied *R. guppyi*; the difference is, however, bridged over by *R. opisthodon*.

54. *Rana opisthodon*.

Rana opisthodon, Bouleng., *Proc. Zool. Soc.* 1884, p. 211, *Tr. Zool. Soc.* XII, 1886, p. 50, pl. x, and *Ann. and Mg. N.H.* (9) 1, 1918, p. 239.

Vomerine teeth in short and strong oblique series behind the choanae, well within their inner borders, the space between the two series equal to or, usually, less than the length of one of them. Tongue with an obtuse papilla in the middle.

Head large, much depressed, a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis obtuse; loreal region very oblique, feebly concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal

to or less than the interorbital width, which is equal to or less than that of the upper eyelid; tympanum distinct, $\frac{1}{2}$ to $\frac{1}{3}$ the diameter of the eye and $\frac{1}{2}$ to once its distance from the latter.

Fingers moderate, blunt or with slightly swollen tips, first as long as or a little longer than the second, third as long as or slightly longer or shorter than the snout; subarticular tubercles large, prominent.

Hind limb rather short or moderate; the tibio-tarsal articulation reaches the posterior border or the centre of the eye, the heels meet or fail to meet when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot. Toes rather short, the tips dilated into small discs with a groove separating the upper from the lower surface, $\frac{2}{3}$ to $\frac{3}{4}$ webbed, 2 phalanges of fourth free, the web not penetrating very far between the outer metatarsals; subarticular tubercles large and oval, very prominent; no tarsal fold; inner metatarsal tubercle elliptic, flat, $\frac{1}{2}$ to $\frac{2}{3}$ the length of the inner toe; outer tubercle, if distinct, small.

Skin smooth or with more or less numerous, small flat porous warts, which may be elongate on the anterior part of the back; a strong glandular fold above the tympanum. Lower parts smooth, except the belly and the thighs, which are feebly granulate.

Olive or dark brown above, with the warts blackish or with a few dark spots and cross-bars on the limbs, vertical bars on the upper lip, and a cross-bar between the eyes; hinder side of thighs with small whitish dots. Lower parts brownish white, the throat entirely light brown.

Males with internal vocal sacs.

Nasal bones large, in contact with each other and with the frontoparietals; ethmoid covered over. Terminal phalanges with feeble transverse distal expansion.

Measurements in millimetres.

	1.	2.	3.	4.	5.
	♀	♂	♂	♀	♀
From snout to vent..	125	80	72	64	61
Head ..	47	29	27	25	23
Width of head ..	56	33	31	27	26
Snout ..	17	10	10	9	9
Eye ..	15	10	10	9	9
Interorbital width ..	10	5.5	5	4	4
Tympanum ..	6	5	4	3.5	4
Fore limb ..	68	44	41	37	33
First finger ..	15	8	8	7	6
Second finger ..	14	7.5	7.5	6.5	6
Third finger ..	18	11	10	9	8
Fourth finger ..	14	7	7	6	6
Hind limb ..	170	108	94	86	86
Tibia ..	55	33	30	27	28
Foot ..	57	36	31	29	28
Third toe ..	27	18	13	14	13
Fourth toe ..	36	24	21	19	19
Fifth Toe ..	20	14	12	11	10

1. Faro Id. (type). 2—4. Treasury Id. (type). 5. Solomon Ids.

This species dispenses with the ordinary metamorphoses, the young emerging from the eggs, which are laid in moist crevices of rocks close to the water, in the perfect condition, without a vestige of tail. The eggs measure 6 to 10 millim. in diameter; the advanced young, within the transparent gelatinous capsule, show no gills, but each side of the abdomen is provided with several regular transverse folds which must be regarded as breathing organs; the tip of the snout bears a small conical horny tubercle for the purpose of cutting through the egg-capsule.

Habitat. Solomon Islands (Faro and Treasury Islands).

Rana ventricosa, T. Vogt, Sitzb. Ges. Nat. Fr. Berl. 1912, p. 8, which, according to the description, differs only in having the toes entirely webbed, is from Lambassa Island.

55. *Rana guppyi*.

Rana guppyi, Bouleng., *Proc. Zool. Soc.* 1884, p. 211, *Tr. Zool. Soc.* XII, 1886, p. 48, pl. ix, and *Ann. and Mag. N.H.* (9) 1, 1918, p. 239.

Vomerine teeth in short and strong, transverse or slightly oblique, straight or curved series behind the choanae and extending outwards beyond the vertical of the inner edges of the latter, the space between the two series greater than the length of one of them. Tongue with a more or less distinct small obtuse papilla in the middle.

Head large, much depressed, broader than long; snout obtusely pointed, projecting a little beyond the mouth, much longer than the eye; canthus rostralis rather strong; loreal region very oblique, not or but feebly concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to or a little less than the interorbital width, which equals that of the upper eyelid; tympanum distinct, $\frac{1}{3}$ to $\frac{1}{2}$ the diameter of the eye, $\frac{3}{4}$ to over its distance from the latter.

Fingers moderately long, the tips dilated into small discs, with a groove in front, separating the upper from the lower surface; first finger longer than the second, third as long as or a little longer than the snout; subarticular tubercles large and prominent.

Hind limb rather long; the tibio-tarsal articulation reaches the eye or the end of the snout, the heels meet or feebly overlap when the limbs are folded at right angles to the body; tibia 3 to $3\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $2\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot. Toes moderately long, the tips dilated into small discs similar to but a little larger than those of the fingers, $\frac{3}{4}$ to entirely webbed, the web not penetrating very far between the outer metatarsals; subarticular tubercles large and oval, prominent; no tarsal fold; inner metatarsal tubercle elliptic, flat, $\frac{2}{3}$ to $\frac{3}{4}$ the length of the inner toe; a rather large but rather indistinct outer tubercle.

Upper parts smooth or with small warts, especially on the upper eyelids and on the sides; an interrupted glandular fold

sometimes present on each side of the anterior part of the back; a strong glandular fold above the tympanum. Lower parts smooth.

Dark olive or brown above, uniform or with rather indistinct darker spots, sometimes with vertical bars on the upper lip and cross-bars on the limbs. Lower parts white or brownish, uniform or spotted with dark brown.

Males with a large external vocal sac on each side of the throat in front of the fore limb.

Nasals very large, in contact with each other and with the frontoparietals; upper surface of ethmoid covered; zygomatic branch of squamosal rather long. Terminal phalanges with feeble transverse distal expansion.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
	♂	♀	♀	♂	♂	♀	♀	♀	♀	♀	♀	♂	♂
From snout to vent ..	165	167	123	98	85	220	215	213	217	132	98	99	80
Head ..	57	58	48	35	32	70	71	71	73	46	35	37	30
Width of head ..	68	69	52	39	35	83	83	85	84	55	40	40	32
Snout ..	23	25	20	14	13	30	27	27	28	20	15	15	13
Eye ..	18	19	15	10	10	20	19	19	19	14	11	12	10
Interorbital width ..	15	15	11	8	7	17	17	18	18	12	7	8	6
Tympanum ..	6	7	5	4	4	8	8	8	9	5	4	4	4
Fore limb ..	95	99	71	58	52	118	113	117	113	80	57	56	49
First finger ..	23	22	16	13	12	27	27	28	27	18	13	12	11
Second finger ..	19	19	13	11	11	23	22	25	23	17	12	11	10
Third finger ..	26	26	20	15	14	30	28	30	29	22	15	15	14
Fourth finger ..	19	21	15	11	11	25	22	23	22	16	11	12	10
Hind limb ..	287	272	205	152	144	325	315	320	312	210	150	164	128
Tibia ..	91	86	68	50	45	103	100	100	100	66	49	52	41
Foot ..	93	86	68	50	45	103	100	100	101	70	49	52	41
Third toe ..	40	39	31	22	22	45	42	47	44	37	20	25	20
Fourth toe ..	59	55	44	35	33	64	62	65	68	46	31	35	29
Fifth toe ..	37	35	28	22	19	34	33	37	35	25	18	23	17

1. Shortland Id. (type). 2—3. Faro Id. 4—10. Guadalcanar Id. 11. Rubiana Id., 12—13. Isabel Id.

One of the largest species of the genus.

Habitat. Solomon Islands (Faro, Shortland, New Georgia, Guadalcanar, Rubiana, and Isabel Islands).

56. *Rana beddomii*.

Polypedates beddomii, Günth., *Proc. Zool. Soc.* 1875, p. 571, pl. lxiii, fig. B.

Polypedates brachytarsus, Günth., *t. c.* p. 572.

Rana beddomii, Bouleng., *Cat. Batr. Écaud.* pp. 55 and 461 (1882), and *Faun. Ind., Rept.* p. 453 (1890); Annand., *Rec. Ind. Mus.* XV, 1918, p. 18, pl. i, fig. 4.

Vomerine teeth in short, transverse or feebly oblique series on a level with the posterior borders of the choanae or just behind the latter, the space between the two series usually equal to or greater than the length of one of them. Tongue with a long pointed papilla in the middle.

Head much depressed, as long as broad or a little broader than long; snout rounded or obtusely pointed, feebly projecting

beyond the mouth, as long as or slightly longer than the eye; canthus rostralis obtuse; loreal region oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils equal to or greater than the interorbital width, which is equal to or less than that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye, 2 to 4 times its distance from the latter.

Fingers moderately long, sometimes with more or less feeble dermal border, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger as long as or a little longer than the second, third as long as or a little longer than the snout; subarticular tubercles large and very prominent.

Hind limb long; the tibio-tarsal articulation reaches the tip of the snout or beyond, rarely only the anterior border of the eye, the heels strongly overlap when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to 2 times in length from snout to vent, as long as or a little shorter than the fore limb, a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers, $\frac{3}{4}$ webbed, 3 phalanges of fourth free, the web reaching the discs of the third and fifth and penetrating $\frac{1}{4}$ to $\frac{1}{2}$ between the outer metatarsals; subarticular tubercles moderate or rather small, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, feebly prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, with small elongate warts or short granular longitudinal folds; a strong granular fold from the eye to the shoulder. Lower parts smooth or feebly granulate on the posterior part of the belly; a discoidal ventral fold sometimes present.

Brown above, with rather indistinct darker spots, rarely uniform pinkish; a light vertebral band sometimes present; a more or less distinct dark cross-bar between the eyes; a black streak on the canthus rostralis and a dark brown or black temporal spot, the tympanum sometimes reddish; limbs with more or less distinct dark cross-bars. Lower parts uniform white, the throat rarely brown or with brown spots.

Males without vocal sacs, with an enlarged pad on the inner side of the first finger.

Nasal bones large and in contact with each other and with the frontoparietals; upper surface of ethmoid covered. Terminal phalanges T-shaped or Y-shaped.

Tadpole remarkable for its long tail, 3 times the length of the body, with mere rudiments of crests. Beak black and very narrow, the upper mandible A-shaped, the lower U-shaped; upper lip divided in the middle, with 4 series of teeth, the outer marginal, with 2 or 3 large papillae on the side; lower lip edged with papillae, with 4 series of teeth, the two outer of which are long and uninterrupted.

[Capt. R. B. Seymour Sewell, I.M.S., has recently found the

characteristic tadpoles of this species at Khandala in the Bombay Ghats. They are remarkable not only for their long tail but also for the fact that their front legs remain concealed beneath the skin for a long period. In their two-legged stage they cling to damp rocks, both horizontal and vertical, and are extremely active out of water, leaping powerfully when disturbed. N. A.]

Ripe uterine eggs measure 2 millim. in diameter in female 40 millim. long from snout to vent.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
	♂	♀	♀	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀
From snout to vent	.. 33	47	56	40	47	38	56	46	40	35	68	45	35
Head ..	.. 13	17	21	15	17	14	21	18	14	13	25	17	13
Width of head	.. 13	17	22	15	17	14	23	18	14	13	28	17	13
Snout ..	.. 4.5	6	8	5.5	6	5	7	6	5	4.5	9	5.5	5
Eye ..	.. 4.5	6	7	5.5	6	5	7	6	5	4.5	9	5.5	5
Interorbital width	.. 2.5	3	3.5	2.5	3	3	4.5	3	2.5	2	5	3	2.5
Tympanum ..	.. 3	3	4	3	3	3	4	3	2.5	2	6	3	3
Fore limb ..	.. 21	30	34	26	27	23	35	29	23	22	43	27	23
First finger ..	.. 4	5	7	5	5	4	7	5	4	4	9	5	4
Second finger	.. 3.5	5	6	4.5	4.5	3.5	6.5	5	4	4	8	4.5	4
Third finger ..	.. 5	7	8	6	7	5	8	7	6	6	11	6	6
Fourth finger	.. 3	5	5.5	4	4.5	3	6	5	4	4	7	4.5	4
Hind limb ..	.. 55	88	99	72	85	60	105	86	70	70	121	82	67
Tibia ..	.. 18	28	31	24	27	19	36	27	22	22	41	26	22
Foot ..	.. 17	26	30	22	25	17	33	21	21	21	37	25	20
Third toe ..	.. 8	12	15	11	12	8	14	12	10	10	19	11	10
Fourth toe ..	.. 12	17	19	11	17	11	20	17	14	14	25	17	14
Fifth toe ..	.. 7	10	11	9	10	7	12	9	8	8	15	9	8

1—2. Sivagiri hills (types). 3. Sivagiri hills (type of *P. brachytarsus*). 4—5. Anamalai hills (types). 6. Anamalai hills (type of *P. brachytarsus*). 7—10. Malabar (types). 11—12. Malabar. 13. Travancore.

Habitat. Forests of Southern India.

Whilst the three preceding species lead to the genus *Platymanthis*, Gthr., this and the following may be regarded as forming a group from which the genus *Cornufer*, Tschudi, is directly derived.

57. *Rana leithii*.

Rana leithii, Bouleng., *Ann. and Mag. N.H.* (6) II, 1888, p. 506, and *Faun. Ind., Rept.* p. 453 (1890).

Vomerine teeth in very short oblique series on a level with the posterior borders of the choanae, the space between the two series a little broader than one of them. Tongue with a long pointed papilla in the middle.

Head moderately depressed, as long as broad; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril nearer the end of the snout than the eye; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ the diameter of the eye, 3 times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in

front, separating the upper from the lower surface; first finger a little shorter than the second, third a little longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels feebly overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, twice in length from snout to vent, shorter than the fore limb, slightly longer than the foot. Toes moderately long, depressed, and dilated at the end like the fingers, $\frac{3}{4}$ webbed, 3 phalanges of fourth free, the web reaching the discs of the third and fifth and not penetrating far between the outer metatarsals; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Skin of back with small scattered warts, some of which are elongate; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Brown above, with small dark spots; a triangular dark spot between the eyes; upper lip with dark vertical bars; limbs with dark cross-bands. Lower parts white, throat mottled with brown.

Measurements in millimetres.

From snout to vent	..	..	..	..	32
Head	..	..	..	..	12
Width of head	..	..	..	..	12
Snout	..	..	..	..	4
Eye	..	..	..	..	4
Interorbital width	..	..	..	..	2
Tympanum	..	..	..	..	2.5
Fore limb	..	..	..	..	19
First finger	..	..	..	..	3
Second finger	..	..	..	..	3.5
Third finger	..	..	..	..	5
Fourth finger	..	..	..	..	3.5
Hind limb	..	..	..	..	52
Tibia	..	..	..	..	16
Foot	..	..	..	..	15

This species is known from a single female specimen, from Matheran near Bombay.

58. *Rana semipalmata*.

Rana semipalmata, Bouleng., *Cat. Batr. Ecaud.* p. 56, pl. iv, fig. 3 (1882), and *Faun. Ind., Rept.* p. 454 (1890); Annand. *Rec. Ind. Mus.* XV, 1918, p. 20, pl. i, fig. 3.

Vomerine teeth in short oblique series just behind the level of the choanae, the space between the two series equal to the length of one of them. Tongue with a long pointed papilla in the middle.

Head rather depressed, as long as broad; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril a little nearer the end of the snout than the eye; distance

between the nostrils a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, nearly as large as the eye and close to it.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger a little longer than the second, third a little longer than the snout; sub-articular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, nearly twice in length from snout to vent, a little shorter than the fore limb, a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers, $\frac{1}{2}$ webbed, $3\frac{1}{2}$ phalanges of fourth and 2 of third and fifth free, the web penetrating barely half way down between the outer metatarsals; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{1}{3}$ the length of the inner toe; no outer tubercle.

Skin of back with short longitudinal glandular folds; sides granulate, with small warts; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Brown above, sides of body darker; loreal and temporal regions blackish; a dark cross-bar between the eyes; limbs with dark cross-bars. Lower parts white, throat and breast mottled with brown.

Males without secondary sexual characters.

The tadpole, described by Annandale, is very similar to that referred by him to *R. leptodactyla*, but the tail is a little longer, the upper lip is broader, more than 3 times the breadth of one of the lateral lobes, the beak is brown and stouter.

Measurements in millimetres (of types).

				♂	♀
From snout to vent	..	..	..	27	36
Head	..	..	..	10	13
Width of head	..	..	..	10	13
Snout	..	..	..	3.5	4
Eye	..	..	..	3.5	4
Interorbital width	..	..	..	2	3
Tympanum	..	..	..	3	3
Fore limb	..	..	..	15	22
Hind limb	..	..	..	41	57
Tibia	..	..	..	13	19
Foot	..	..	..	12	17

Habitat. Malabar.

59. *Rana leptodactyla*.

Polypedates brevipalmatus, Günth., *Proc. Zool. Soc.* 1875, p. 572.

Rana leptodactyla, Bouleng., *Cat. Batr. Ecaud.* p. 57 (1882), and *Faun. Ind., Rept.* p. 454 (1890); Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 95; Annand., *Rec. Ind. Mus.* XV, 1918, p. 19, pl. i, fig. 2.

Vomerine teeth in short transverse or feebly oblique series or small feeble groups on a level with the posterior borders of the choanae or just behind them, the distance between the two series equal to or a little less than the length of one of them. Tongue with a long pointed papilla in the middle.

Head rather strongly depressed, as long as broad or a little broader than long; snout rounded, feebly projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis very obtuse or indistinct; loreal region oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the inter-orbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye, 1 to 3 times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger shorter than the second, third a little longer than the snout; sub-articular tubercles moderately large, not very prominent.

Hind limb long; the tibio-tarsal articulation reaches the tip of the snout or beyond, rarely between the eye and the tip of the snout, the heels strongly overlap when the limbs are folded at right angles to the body; tibia 4 to 5 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, slightly longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers, $1\frac{1}{4}$ webbed or the web reduced to a mere rudiment, and not penetrating or scarcely penetrating between the outer metatarsals; subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle elliptic, feebly prominent, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the inner toe; no outer tubercle.

Skin of back with short longitudinal glandular folds; sides granulate, with flat warts; a strong granular fold from the eye to the shoulder. Lower parts smooth, or posterior part of belly feebly granulate.

Olive or brownish above, mottled with darker; a more or less distinct subtriangular dark spot between the eyes, often limited in front by a light cross-bar; a black streak along the canthus rostralis and a black temporal spot; a light vertebral band sometimes present; limbs with dark cross-bars. Lower parts white, uniform or spotted with brown, sometimes brown dotted with white.

Males without secondary sexual characters.

Skeleton as in *R. beddomii*.

The tadpole referred to this species by Annandale is pretty normal in shape, the tail about $1\frac{1}{4}$ times as long as the body and ending in a blunt point; but the mouth-disc is very remarkable, without horny teeth; the upper lip forms a crescentic membrane which can be closed down over the mouth, the lower is divided into three lobes, and there is a large, rounded lateral lobe; all fringed with pointed papillae; papillae are scattered on

the inner side of the lobes; beak minutely serrated, edged with black. The upper surface and the tail are yellow, with boldly contrasting black markings.

The ova in the uterus measure $1\frac{1}{2}$ millim. in a female 30 millim. long from snout to vent.

Measurements in millimetres.

	1.	2.	3.	4.	5.	6.	7.
	♂	♀	♀	♀	♀	♀	♀
From snout to vent ..	33	45	30	36	34	32	35
Head ..	13	15	12	14	13	13	13
Width of head ..	13	17	12	14	13	13	14
Snout ..	4	6	4	5	4	4	4
Eye ..	4	6	4	5	4	4	5
Interorbital width ..	2.5	2.5	2	2.5	2.5	2.5	3
Tympanum ..	2.5	3	2	2.5	2.5	2.5	2.5
Fore limb ..	21	28	17	23	21	21	23
First finger ..	3	4	3	4	3	3	3
Second finger ..	4	5	4	4.5	4	4	4
Third finger ..	5	7	4	6	5	5	6
Fourth finger ..	4	5	3	4	4	4	4
Hind limb ..	62	88	52	68	62	62	72
Tibia ..	20	27	17	22	20	20	24
Foot ..	19	26	16	21	19	19	22
Third toe ..	9	11	7	10	9	9	10
Fourth toe ..	12	16	11	14	12	12	14
Fifth toe ..	6	9	5	7	6	6	7

1—3. Malabar (types). 4—5. Malabar. 6. Anamalai hills (type). 7. Devicolum, Travancore.

Habitat. Forests of Southern India.

60. *Rana diplosticta*.

Ixalus diplostictus, Günth., *Proc. Zool. Soc.* 1875, p. 574, pl. lxiii, fig. C.

Rana diplosticta, Bouleng., *Cat. Batr. Ecaud.* p. 58 (1882), and *Faun. Ind., Rept.*, p. 455 (1890).

Vomerine teeth, if distinct, in very feeble oblique groups just behind the level of the posterior borders of the choanae. Tongue with a long pointed papilla in the middle.

Head moderately depressed, as long as broad; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region feebly oblique, feebly concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width or the width of the upper eyelid; tympanum very distinct, a little more than $\frac{1}{2}$ the diameter of the eye, $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger shorter than the second, third as long as or a little longer than the snout; subarticular tubercles moderately large, not very prominent.

Hind limb long; the tibio-tarsal articulation reaches the tip of the snout or beyond, rarely between the eye and the tip of the snout, the heels strongly overlap when the limbs are folded

at right angles to the body ; tibia $3\frac{1}{2}$ to 4 times as long as broad, $1\frac{1}{2}$ to nearly 2 times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, as long as or a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers. $\frac{1}{2}$ webbed, the web not penetrating between the outer metatarsals ; subarticular tubercles rather small, feebly prominent ; no tarsal fold ; inner metatarsal tubercle elliptic, feebly prominent, $\frac{1}{2}$ the length of the inner toe ; no outer tubercle.

Skin smooth above, with fine interrupted longitudinal glandular folds on the back ; sides granulate ; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Grey or pinkish brown above ; snout lighter, bordered by a dark cross-bar between the eyes ; a broad black canthal streak and a black temporal spot ; usually a few large black spots on the sides, one, above the groin, being constant ; limbs with regular dark cross-bands. Lower parts brownish, belly sometimes with small white spots.

Males without secondary sexual characters.

Eggs very large, 2 millim. in diameter in uterus of female measuring 27 millim. from snout to vent.

Measurements in millimetres.

			1. ♂	2. ♀	3. ♀	4. ♀
From snout to vent	..	..	25	27	25	35
Head ..	..	..	10	11	10	13
Width of head ..	..	..	10	11	10	13
Snout ..	..	..	3.5	4	3.5	4
Eye ..	..	..	3.5	4	3.5	4
Interorbital width ..	..	..	2	2.5	2	3
Tympanum ..	..	..	2	2.5	2	2.5
Fore limb ..	..	..	14	16	15	19
First finger ..	..	..	2	2.5	2.5	3
Second finger ..	..	..	2.5	3	3	4
Third finger ..	..	..	3.5	4	4	5.5
Fourth finger ..	..	..	2	3	3	3
Hind limb ..	..	..	44	45	51	69
Tibia ..	..	..	14	14	16	23
Foot ..	..	..	13	14	15	19
Third toe ..	..	..	6	6	6	9
Fourth toe ..	..	..	8	9	9	12
Fifth toe ..	..	..	3.5	4	4	7

1—3. Malabar (types). 4. Anamalai hills.

Habitat. Malabar.

61. *Rana phrynoderma*.

Rana phrynoderma, Bouleng., *Cat. Batr. Ecaud.* p. 462 (1882), and *Faun. Ind., Rept.* p. 455 (1890).

Vomerine teeth in short transverse or slightly oblique series on a level with the posterior borders of the choanae, the distance between the two series equal to the length of one of them. Tongue with a long-pointed papilla in the middle.

Head rather strongly depressed, as long as broad or a little broader than long; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis very obtuse or indistinct; loreal region oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum moderately distinct, about $\frac{2}{3}$ the diameter of the eye and 1 to $1\frac{1}{2}$ times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger shorter than the second, third slightly longer than the snout; sub-articular tubercles moderately large, not very prominent.

Hind limb long; the tibio-tarsal articulation reaches the tip of the snout or a little beyond, the heels strongly overlap when the limbs are folded at right angles to the body; tibia 4 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, nearly as long as the fore limb, a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers, with a mere rudiment of web, which does not penetrate between the outer metatarsals; subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle elliptic, feebly prominent, $\frac{1}{2}$ to $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Upper parts covered with strong warts of different sizes and short glandular folds; a strong glandular fold from the eye to the shoulder. Belly granulate.

Dark greyish brown above, with obsolete darker spots; limbs with regular dark cross-bars. Lower parts brown, dotted with whitish.

Males without secondary sexual characters.

Measurements in millimetres.

	1.	2.	3.
	♂	♂	♂
From snout to vent	35	32	35
Head	15	13	14
Width of head	15	13	16
Snout	4.5	4	4.5
Eye	4.5	4	4.5
Interorbital width	2.5	2	2.5
Tympanum	2.5	2.5	2.5
Fore limb	21	19	21
First finger	3	2.5	2.5
Second finger	4	3.5	3.5
Third finger	5	4.5	5
Fourth finger	3.5	2.5	3
Hind limb	61	52	63
Tibia	20	18	22
Foot	18	16	19
Third toe	9	6	9
Fourth toe.. .. .	11	10	11
Fifth toe	6	5	7

1—2. Types.

Habitat. Anamalai hills, Malabar.

Subgenus *Hylorana*.Tschudi, *Class. Batr.* p. 37 (1838).

Tips of toes, or of fingers and toes, dilated into more or less distinct discs bearing a crescentic or horseshoe-shaped groove separating the upper from the lower surface¹; outer metatarsals separated nearly to the base, or, rarely, bound together in their basal half; omosternal style not forked at the base, sometimes with a very small notch; terminal phalanges with feeble transverse expansion, or T-shaped with the transverse limb short or long.

I. Discs of fingers, if present, without the above-mentioned groove, or with the groove very indistinct.

A. Fingers obtuse, first not longer than second, with a rudiment of pollex projecting as a knob or spine; tibio-tarsal articulation reaching eye or between eye and nostril; heels not overlapping; tibia 3 times as long as broad; head broader than long, loreal region nearly vertical; tympanum $\frac{3}{4}$ to $\frac{1}{2}$ diameter of eye; toes $\frac{3}{4}$ or nearly entirely webbed; dorso-lateral fold incomplete or absent; male without vocal sacs, with a large gland above axil ... *R. holsti*, Blgr.

B. Fingers with swollen tips, first longer than second; tibio-tarsal articulation reaching tympanum or eye; heels not or but feebly overlapping; tibia 4 to $4\frac{1}{2}$ times as long as broad; head large; loreal region oblique; tympanum $\frac{3}{4}$ to once diameter of eye; toes $\frac{3}{4}$ or nearly entirely webbed; dorso-lateral fold narrow; male with internal vocal sacs ... *R. curtipes*, Jerd.

C. Fingers with swollen or dilated tips; heels overlapping; head moderately large, not broader than long.

1. Fingers with the tips merely swollen, first longer than second; dorso-lateral fold extending to hip, or broken up behind the sacrum.

a. Toes $\frac{3}{4}$ to nearly entirely webbed; tibia 4 to 5 times as long as broad, $1\frac{1}{4}$ to 2 times in length from snout to vent.

Vomerine teeth in long and strong series touching the anterior corners of the choanae; head a little longer than broad; snout longer than eye; loreal region moderately oblique; tympanum $\frac{3}{4}$ to $\frac{1}{2}$ diameter of eye; tibio-tarsal articulation reaching between eye and tip of snout; dorso-lateral fold narrow or rather broad; male with external vocal sacs and a humeral gland. ... *R. guentheri*, Blgr.

Vomerine teeth in oblique groups usually extending beyond level of posterior borders of choanae; head as long as broad; snout not longer than eye; loreal region moderately oblique; tympanum $\frac{3}{4}$ to $\frac{1}{2}$ diameter of eye; tibio-tarsal articulation reaching nostril or tip of snout; dorso-lateral fold broad or rather broad; male with internal vocal sacs and a humeral gland ... *R. mortenseni*, Blgr.

Vomerine teeth in oblique groups extending more or less beyond level of posterior borders of choanae; head as long as broad or slightly longer; snout not longer than eye; loreal region feebly oblique; tympanum $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; tibio-tarsal articulation reaching eye or between eye and tip of snout; dorso-lateral fold very broad; male with internal vocal sacs and no humeral or cubital gland ... *R. latouchii*, Blgr.

¹ Absent in some specimens of *R. curtipes*.

Vomerine teeth in oblique groups just behind level of choanae; head as long as broad; snout longer than eye; loreal region moderately oblique; tympanum nearly as large as eye; tibio-tarsal articulation reaching beyond tip of snout; male with internal vocal sacs and a cubital gland ...

R. cubitalis, M. Smith.

- b. Toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed; tibia $1\frac{1}{2}$ to a little less than 2 times in length from snout to vent; tympanum $\frac{3}{4}$ to $\frac{5}{8}$ diameter of eye; vomerine teeth in oblique groups or series between the choanae; dorso-lateral fold moderate or rather broad.

Loreal region moderately oblique; interorbital region a little narrower than the upper eyelid; tibia 3 to 4 times as long as broad; male with internal vocal sacs and a very large gland on each side above and behind the shoulder ...

R. adenopleura, Blgr.

1. Loreal region feebly oblique or nearly vertical; interorbital region as broad as or a little broader than the upper eyelid; tibia 4 to $4\frac{1}{2}$ times as long as broad; male with external vocal sacs ...

R. gracilis, Gravh.

- c. Toes nearly entirely webbed; tibia $1\frac{1}{2}$ times in length from snout to vent; loreal region vertical; tympanum $\frac{3}{4}$ diameter of eye; vomerine teeth in oblique groups between and extending a little beyond the choanae; dorso-lateral fold narrow ...

R. elberti, Roux.

2. Fingers with the tips swollen into small discs; loreal region feebly oblique or nearly vertical; tympanum $\frac{3}{4}$ to nearly once diameter of eye.

Tibio-tarsal articulation reaching tip of snout or a little beyond; tibia $4\frac{1}{2}$ to $5\frac{1}{2}$ times as long as broad; toes $\frac{3}{4}$ webbed; first finger not longer than second; vomerine teeth extending considerably beyond level of posterior borders of choanae; dorso-lateral fold very narrow...

R. sauteri, Blgr.

Tibio-tarsal articulation reaching eye or nostril; tibia $3\frac{1}{2}$ to 4 times as long as broad; toes webbed to the discs of the third and fifth; first finger a little longer than second; vomerine teeth between or just behind posterior borders of choanae; dorso-lateral fold rather broad; male with internal vocal sacs and a humeral gland...

R. nigrovittata, Blyth.

Tibio-tarsal articulation reaching eye or between eye and nostril; tibia 4 to $4\frac{1}{2}$ times as long as broad; toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed; first finger much longer than second; vomerine teeth between the choanae or extending a little beyond; dorso-lateral fold broad; male with external vocal sacs and a humeral gland ...

R. leptoglossa, Cope.

II. Discs of fingers bearing a groove separating the upper from the lower surface.

- A. Tips of fingers and toes dilated into small discs which are not twice as broad as the narrowest part of the corresponding penultimate phalanx.

1. A glandular dorso-lateral fold.

- a. Vomerine teeth in strong oblique series nearly touching anterior corners of choanae; first finger longer than second; tibia 4 to $4\frac{1}{2}$ times as long as broad; no outer metatarsal tubercle; tympanum $\frac{3}{4}$ to $\frac{5}{8}$ diameter of eye; male with external vocal sacs and a humeral gland.

Head as long as broad; loreal region moderately oblique; interorbital region as broad as upper eyelid; tibio-tarsal articulation reaching nostril; tibia shorter than foot; toes nearly entirely webbed ...

R. humeralis, Blgr.

Head as long as broad; loreal region more oblique; interorbital region narrower than upper eyelid; tibio-tarsal articulation reaching eye; tibia longer than foot; toes $\frac{3}{4}$ webbed ...

R. miopus, Blgr.

Head longer than broad; loreal region feebly oblique; interorbital region as broad as upper eyelid; tibio-tarsal articulation reaching between eye and tip of

snout; tibia as long as foot; toes nearly entirely webbed

... *R. oatesii*, Blgr.

b. Vomerine teeth in short groups or series remote from the anterior corners of the choanae.

a. Tibia as long as or shorter than foot; first finger as long as or a little longer than second; head longer than broad; tympanum $\frac{3}{4}$ to once diameter of eye.

Tibio-tarsal articulation reaching eye or tip of snout; tibia 4 to $4\frac{1}{2}$ times as long as broad; toes $\frac{3}{4}$ to nearly entirely webbed; dorso-lateral fold broad; male with internal vocal sacs and no humeral gland

... *R. crythraea*, Schleg.

Tibio-tarsal articulation reaching tip of snout or beyond; tibia $4\frac{1}{2}$ to $5\frac{1}{2}$ times as long as broad; toes $\frac{1}{2}$ webbed; dorso-lateral fold narrow; male without vocal sacs or humeral gland...

... *R. macrodactyla*, Gthr.

Tibio-tarsal articulation reaching between eye and tip of snout; tibia 6 times as long as broad; toes $\frac{3}{4}$ webbed; dorso-lateral fold narrow

... *R. aurantiaca*, Blgr.

Tibio-tarsal articulation reaching far beyond tip of snout; toes $\frac{3}{4}$ webbed; dorso-lateral fold narrow

... *R. sanguinea*, Boettg.

B. Tibia usually longer than foot, never shorter; first finger longer than second; tympanum $\frac{3}{4}$ to once diameter of eye.

*Dorso-lateral fold narrow or moderately broad; male with internal vocal sacs and a humeral gland.

Head as long as broad or a little longer than broad; vomerine teeth extending beyond level of posterior borders of choanae; tibio-tarsal articulation reaching nostril, tip of snout, or a little beyond; tibia 4 to $4\frac{1}{2}$ times as long as broad; discs of third and fourth fingers not more than $\frac{1}{2}$ diameter of tympanum; toes $\frac{3}{4}$ webbed

... *R. temporalis*, Gthr.

Head as long as broad or a little longer than broad; vomerine teeth not extending beyond level of posterior borders of choanae; tibio-tarsal articulation reaching tip of snout; tibia 5 to $5\frac{1}{2}$ times as long as broad; discs of third and fourth fingers $\frac{2}{3}$ to $\frac{1}{2}$ diameter of tympanum; toes $\frac{3}{4}$ webbed

... *R. florensis*, Blgr.

Head longer than broad; tibio-tarsal articulation reaching nostril or tip of snout; tibia 5 to $5\frac{1}{2}$ times as long as broad; discs of third and fourth fingers $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed

... *R. nicobariensis*, Stol.

**Dorso-lateral fold narrow; head longer than broad; tibio-tarsal articulation reaching tip of snout or beyond; tibia 5 to 6 times as long as broad; toes $\frac{3}{4}$ webbed; male with internal vocal sacs and no humeral gland.

Loreal region nearly vertical, deeply concave; tibia $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent

... *R. varians*, Blgr.

Loreal region feebly oblique, moderately concave; tibia $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent

... *R. alticola*, Blgr.

***Dorso-lateral fold broad; head longer than broad; tibio-tarsal articulation reaching nostril

... *R. celebensis*, Peters.

γ. Tibia longer than foot, 4 to 5 times as long as broad; tympanum $\frac{1}{2}$ diameter of eye; dorso-lateral fold narrow.

First finger as long as second; discs of fingers smaller than those of the toes

... *R. garoensis*, Blgr.

First finger longer than second; discs of fingers as large as those of the toes; male with external vocal sacs and no humeral gland

... *R. nasica*, Blgr.

2. Glandular dorso-lateral fold absent or represented by a chain of large warts.

a. Toes entirely webbed; outer metatarsal tubercle absent or very indistinct.

a. First finger much longer than second;

tibio-tarsal articulation reaching between eye and tip of snout, tip of snout, or slightly beyond; tibia 3 to 4 times as long as broad; tympanum $\frac{3}{8}$ to $\frac{3}{4}$ diameter of eye; male with external vocal sacs and a humeral gland ...

R. arfaki, A. B. Mey.

- a.* First finger as long as or a little longer than second; tibio-tarsal articulation reaching tip of snout or a little beyond.

Tympanum $\frac{3}{8}$ to $\frac{1}{2}$ diameter of eye; interorbital region as broad as or a little broader than upper eyelid; tibia 4 to 5 times as long as broad; male with internal vocal sacs and no humeral gland ...

R. andersonii, Blgr.

Tympanum $\frac{3}{4}$ size of eye; interorbital space a little narrower than upper eyelid ...

R. schmackeri, Boettg.

- b.* Toes not more than $\frac{3}{4}$ webbed; an outer metatarsal tubercle.

a. Tibio-tarsal articulation reaching considerably beyond tip of snout; first finger slightly longer than second; toes $\frac{1}{2}$ webbed; tympanum $\frac{1}{2}$ diameter of eye ...

R. ijimæ, Stejn.

- β.* Tibio-tarsal articulation not reaching beyond tip of snout; first finger longer than second; tympanum $\frac{3}{8}$ to $\frac{3}{4}$ diameter of eye.

*Toes $\frac{3}{4}$ to $\frac{3}{8}$ webbed; outer metatarsals separated nearly to the base; tibia 4 to $5\frac{1}{2}$ times as long as broad; male with internal vocal sacs.

Interorbital space a little narrower than the upper eyelid; head a little longer than broad; male without humeral gland ...

R. signata, Gthr.

Interorbital space as broad as or a little narrower than the upper eyelid; head as long as broad; male with a humeral gland ...

R. picturata, Blgr.

Interorbital space nearly twice as broad as the upper eyelid ...

R. moellendorffi, Boettg.

**Toes not more than $\frac{3}{8}$ webbed; outer metatarsals separated nearly to the base; first finger much longer than second; head as long as broad or broader than long; male with external vocal sacs and a humeral gland.

Toes $\frac{1}{2}$ to $\frac{3}{8}$ webbed; an outer metatarsal tubercle;

tibia 4 to $4\frac{1}{2}$ times as long as broad ...

R. glandulosa, Blgr.

Toes $\frac{1}{2}$ webbed; no outer metatarsal tubercle ...

R. baramica, Boettg.

***Toes less than $\frac{1}{2}$ webbed; outer metatarsals bound together in basal third.

Head as long as broad; tibia 3 to 4 times as long as broad; toes $\frac{1}{2}$ webbed; male without vocal sacs, without humeral gland ...

R. luctuosa, Peters.

Head longer than broad; tibia 5 times as long as broad; toes $\frac{1}{2}$ webbed ...

R. debussyi, v. Kamp.

- B.* Tips of fingers dilated into moderate or rather large discs, as large as or smaller than those of the toes, the width of which equals at least twice that of the narrowest part of the penultimate phalanx.

1. Discs of fingers smaller than those of the toes; tibia usually more than $1\frac{1}{2}$ times in length from snout to vent; a glandular dorso-lateral fold; head as long as broad or longer than broad; tympanum $\frac{3}{8}$ to once diameter of eye.

- a.* Male with large external vocal sacs and a humeral gland; tibia 4 to $4\frac{1}{2}$ times as long as broad.

Tibio-tarsal articulation reaching beyond tip of snout; heels strongly overlapping; tibia $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent ...

R. grisea, v. Kamp.

Tibio-tarsal articulation reaching eye or between eye and nostril; heels more or less overlapping; tibia 2 to a little over 2 times in length from snout to vent...

R. krefftii, Blgr.

- b.* Male with vocal sacs internal, exceptionally external but feebly developed; no humeral gland.

Tibio-tarsal articulation reaching nostril, tip of snout, or beyond; heels strongly overlapping; tibia 4 to $5\frac{1}{2}$

- times as long as broad, $1\frac{1}{2}$ to $1\frac{1}{4}$ times in length from snout to vent ... *R. papua*, Less.
- Tibio-tarsal articulation reaching eye or between eye and nostril; heels feebly overlapping; tibia $3\frac{1}{2}$ to 4 times as long as broad, 2 to $2\frac{1}{8}$ times in length from snout to vent ... *R. daemeli*, Sldr.
2. Discs of fingers as large as those of the toes; no complete dorso-lateral fold; tibio-tarsal articulation reaching tip of snout or a little beyond; tibia $3\frac{1}{2}$ to 5 times as long as broad, $1\frac{1}{2}$ to 2 times in length from snout to vent; tympanum $\frac{1}{2}$ diameter of eye; male with large external vocal sacs and a humeral gland ... *R. swinhoana*, Blgr.
3. Discs of fingers as large as or a little smaller than those of toes; tibio-tarsal articulation reaching far beyond tip of snout; tibia 6 to $7\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $1\frac{1}{4}$ times in length from snout to vent; tympanum $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye; male with external vocal sacs and no humeral gland.
- No dorso-lateral fold; nostril slightly nearer eye than tip of snout; tympanum deeply sunk ... *R. cavitympanum*, Blgr.
- Dorso-lateral fold, if present, not extending to sacrum; nostril nearer tip of snout than eye ... *R. whiteheadi*, Blgr.
- Dorso-lateral fold extending to hip; nostril equally distant from eye and from tip of snout, or a little nearer latter ... *R. jerboa*, Gthr.
- C. Tips of fingers dilated into large or rather large discs, larger than those of the toes, the width of which equals at least twice that of the narrowest part of the penultimate phalanx.
1. Glandular dorso-lateral fold more or less distinct, at least anteriorly.
- a. First finger as long as or slightly shorter than second; tibia 4 to 6 times as long as broad.
- a. Male with internal vocal sacs; dorso-lateral fold feebly prominent and usually incomplete.
- Tibio-tarsal articulation reaching beyond tip of snout; toes entirely webbed; head as long as broad or slightly longer; tympanum $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye; male without humeral gland ... *R. hosii*, Blgr.
- Tibio-tarsal articulation reaching tip of snout or not quite so far or a little beyond; toes webbed to the discs of the third and fifth; head longer than broad; tympanum $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye; male without humeral gland ... *R. chalconota*, Schleg.
- Tibio-tarsal articulation reaching nostril or tip of snout; toes $\frac{3}{4}$ webbed; head as long as broad; snout shorter than eye; tympanum $\frac{1}{2}$ diameter of eye; male with a humeral gland ... *R. macrops*, Blgr.
- β. Male with external vocal sacs and no humeral gland; tibio-tarsal articulation reaching beyond tip of snout; toes entirely or nearly entirely webbed; head as long as broad or a little longer.
- Dorso-lateral fold distinct only anteriorly; tympanum $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye ... *R. graminea*, Blgr.
- Dorso-lateral fold narrow, complete; tympanum $\frac{1}{3}$ to $\frac{1}{2}$ diameter of eye ... *R. monticola*, And.
- b. First finger shorter than second; dorso-lateral fold narrow, complete, tibio-tarsal articulation reaching beyond tip of snout.
- First finger a little shorter than second; tibia 6 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent; toes nearly entirely webbed; head as long as broad; tympanum $\frac{1}{3}$ to $\frac{1}{2}$ diameter of eye ... *R. gerbillus*, Annand.
- First finger a little shorter than second; tibia 6 to $6\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent; toes webbed to the discs of the third and fifth; head as long as broad or slightly longer; tympanum $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye ... *R. luzonensis*, Blgr.

- First finger much shorter than second; tibia $1\frac{1}{2}$ times as length from snout to vent; toes nearly entirely webbed; head longer than broad; tympanum $\frac{2}{3}$ diameter of eye ... *R. mearnsii*, Stejn.
2. Glandular dorso-lateral fold absent; toes entirely or nearly entirely webbed.
- a. Tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye; discs of fingers not broader than long.
- a. Tibio-tarsal articulation reaching between eye and nostril; belly granulate.
- Tibia 5 times as long as broad, $1\frac{1}{2}$ times in length from snout to vent; first finger as long as second; tympanum $\frac{2}{3}$ diameter of eye; back smooth ... *R. everetti*, Blgr.
- Tibia $2\frac{1}{2}$ times in length from snout to vent; first finger longer than second; tympanum $\frac{1}{2}$ diameter of eye; head and back very rough with large tubercles ... *R. ishikawa*, Stejn.
- b. Tibio-tarsal articulation reaching beyond tip of snout; tibia $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent.
- First finger as long as second; tibia $5\frac{1}{2}$ to 6 times as long as broad; tympanum $\frac{2}{3}$ diameter of eye; belly smooth ... *R. crassiovis*, Blgr.
- First finger shorter than second; tibia 6 times as long as broad; tympanum $\frac{2}{3}$ diameter of eye; belly granulate ... *R. kampeni*, Blgr.
- First finger as long as or longer than second, tympanum $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye; belly granulate; male with external vocal sacs ... *R. livida*, Blyth.
- b. Tympanum more or less distinct, or obscured by granules, not $\frac{1}{2}$ diameter of eye; discs of fingers very large, often broader than long, with a transverse groove on the upper surface, corresponding to the long horizontal limb of the terminal phalanx; first finger as long as or shorter than second.
- a. Third finger not more than twice as long as snout, first with well-developed terminal disc; foot shorter than tibia.
- Snout shorter than eye; tibio-tarsal articulation reaching tip of snout or not quite so far; tibia $3\frac{1}{2}$ to 4 times as long as broad, $1\frac{1}{2}$ to 2 times in length from snout to vent; male without vocal sacs ... *R. ricketti*, Blgr.
- Snout as long as eye; tibio-tarsal articulation reaching beyond tip of snout; tibia 4 to $5\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to $1\frac{1}{2}$ times in length from snout to vent; male with external vocal sacs ... *R. latopalmata*, Blgr.
- b. Third finger more than twice as long as snout.
- Vomerine teeth present; first finger with the tip merely swollen; tibio-tarsal articulation reaching beyond tip of snout; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent; foot shorter than tibia; male with internal vocal sacs ... *R. himalayana*, Blgr.
- Vomerine teeth present; first finger with the tip merely swollen; tibio-tarsal articulation reaching nostril or tip of snout; tibia $4\frac{1}{2}$ to $5\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to $1\frac{1}{2}$ times in length from snout to vent; foot as long as or slightly shorter than tibia; male with internal vocal sacs ... *R. formosa*, Gthr.
- Vomerine teeth absent; first finger with well-developed terminal disc; tibio-tarsal articulation reaching tip of snout or slightly beyond; tibia 4 times as long as broad, $1\frac{3}{4}$ to $1\frac{1}{2}$ times in length from snout to vent; foot shorter than tibia ... *R. hainanensis*, Blgr.

The classification of the numerous species included in this subgenus presents great difficulties. A linear arrangement is best based on the degree of specialization of the fingers and toes, as expressing the general drift of evolution, and this has been

carried out as far as it is possible in a group which is manifestly of polyphyletic origin.

The species may be grouped under ten sections :—

- A. RANAE HOLSTIANAE. Fingers simply obtuse, not at all dilated at the end: a projecting rudiment of pollex; discs of toes small.

R. holsti.

- B. RANAE CURTIPEDES. An aberrant type, answering, according to individuals, the definition of both *Rana* and *Hylorana*.

R. curtipes.

- C. RANAE GRACILES. Fingers with swollen or dilated tips without the groove which is present on the feebly dilated tips of the toes.

R. guentheri, *R. mortenseni*, *R. latouchii*, *R. cubitalis*, *R. adeno-pleura*, *R. gracilis*, *R. elberti*, *R. sauteri*, *R. nigrovittata*, *R. leptoglossa*.

- D. RANAE ERYTHRAE. Fingers with discs similar to and not larger than those of the toes, which are not twice as broad as the penultimate joint; transverse distal expansion of terminal phalanx feeble; dorso-lateral fold present.

R. humeralis, *R. miopus*, *R. oatesii*, *R. erythraca*, *R. macrodactyla*, *R. aurantiaca*, *R. sanguinea*, *R. temporalis*, *R. florensis*, *R. nicobariensis*, *R. varians*, *R. alticola*, *R. celebensis*, *R. garoensis*, *R. nasica*.

- E. RANAE LUCTUOSAE. As in the preceding, but dorso-lateral fold absent or reduced to a chain of large warts.

R. arjaki, *R. andersonii*, *R. schmackeri*, *R. ijimae*, *R. signata*, *R. picturata*, *R. moellendorffi*, *R. glandulosa*, *R. baramica*, *R. luctuosa*, *R. debussyi*.

- F. RANAE PAPUAE. As in D, but discs of toes at least twice as broad as the penultimate joint.

R. grisea, *R. kreftii*, *R. papua*, *R. daemeli*.

- G. RANAE SWINHOANAE. As in the preceding, but dorso-lateral fold incomplete.

R. swinhoana.

- H. RANAE JERBOAE. As in F, but hind limb extremely elongate and dorso-lateral fold present or absent.

R. cavitympanum, *R. whiteheadi*, *R. jerboa*.

- I. RANAE CHALCONOTAE. Fingers with discs similar to those of the toes, but larger, with the transverse limb of the T-shaped terminal phalanx well developed, but not longer than the longitudinal limb; dorso-lateral fold present or absent.

R. hosii, *R. chalconota*, *R. macrops*, *R. graminea*, *R. monticola*, *R. luzonensis*, *R. gerbillus*, *R. mearnsii*, *R. everetti*, *R. ishikavae*, *R. crassiovis*, *R. kampeni*, *R. livida*.

K. RANAE FORMOSAE. Discs of fingers larger still, with longer transverse limb to the T-shaped terminal phalanx; dorso-lateral fold absent.

R. ricketti, *R. latopalmata*, *R. himalayana*, *R. formosa*, *R. hainanensis*.

62. *Rana holsti*.

Rana holsti, Bouleng., *Ann. and Mag. N.H.* (6) X, 1892, p. 302; Stejneger, *Herp. Jap.* p. 105, fig. (1907).

Rana subaspera, Barbour, *Proc. Biol. Soc. Wash.* XXI, 1908, p. 189, and *Proc. N. Engl. Zool. Club*, IV, 1909, p. 58.

Babina holsti, Van Denburgh, *Proc. Calif. Ac.* (4) III, 1912, p. 197.

Babina subaspera, Van Denburgh, *l.c.* p. 199.

Vomerine teeth in oblique groups behind the level of the choanae, equally distant from each other and from the latter.

Head moderately depressed, broader than long; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region nearly vertical, slightly concave; nostril a little nearer the end of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or slightly exceeds that of the upper eyelid; tympanum distinct (sometimes nearly hidden in *R. subaspera* according to Van Denburgh), $\frac{3}{4}$ to $\frac{1}{2}$ the diameter of the eye, $1\frac{1}{2}$ to 3 times its distance from the latter.

Fingers moderately long, obtuse, first much longer than the second, third longer than the snout, second and third with a dermal margin on the inner side; subarticular tubercles strong, prominent; inner metacarpal forming a very prominent knob.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels meeting or not when the limbs are folded at right angles to the body; tibia 3 times as long as broad, half length of head and body, or less, shorter than the fore limb, slightly longer than the foot. Toes with the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface, $\frac{1}{4}$ or nearly entirely webbed, one or two phalanges of fourth free (merely margined); web separating the outer metatarsals for about $\frac{2}{3}$ of their length; subarticular tubercles strong; no tarsal fold; inner metatarsal tubercle elliptic, not very prominent, $\frac{2}{3}$ to $\frac{3}{4}$ the length of the inner toe; no outer tubercle.

Back with a few scattered small warts, or (*R. subaspera*) with numerous low, prominent warts; body and limbs with whitish, pearl-like excrescences; glandular dorso-lateral fold present or absent; if present, originating above the tympanum and broken up behind; the distance between the folds, on the scapular region, $4\frac{1}{2}$ times in length from snout to vent; a glandular fold from below the eye to above the arm.

Olive above, sides with blackish spots ; a dark streak from the nostril to the eye and a blackish temporal spot ; tympanum reddish brown ; a light streak from below the eye to the angle of the mouth ; limbs with dark cross-bars ; hinder side of thighs marbled with black. Lower parts dirty white, with brown dots or marblings, or throat entirely dark brown.

Males without vocal sacs ; a large kidney-shaped gland above the axil ; light-coloured spine-like asperities on the two inner fingers, on the inner side of the arms, and sprinkled over the entire chest and throat ; the inner metacarpal bone forms a spine which may pierce the skin.

Nasal bones moderately large and separated from each other.

Measurements of the type specimen, in millimetres.

From snout to vent	..	..	..	..	♀ 120
Head	..	..	..	..	37
Width of head	..	..	..	..	44
Snout	..	..	..	..	13
Eye	..	..	..	..	13
Interorbital width	..	..	..	..	11
Tympanum	..	..	..	..	8
Fore limb	..	..	..	..	70
First finger	..	..	..	..	16
Second finger	..	..	..	..	12
Third finger	..	..	..	..	18
Fourth finger	..	..	..	..	12
Hind limb	..	..	..	..	170
Tibia	..	..	..	..	58
Foot	..	..	..	..	55
Third toe	..	..	..	..	27
Fourth toe	..	..	..	..	42
Fifth toe	..	..	..	..	30

Habitat. Loo Choo Islands (Okinawa and Onami Oshima).

According to Van Denburgh, *R. subaspera* differs from *R. holsti* only in its more warty skin, and this does not seem to me to justify the specific distinction.

The above description is drawn up from the type specimen, the only one I have seen, and from the accounts given by Barbour and Van Denburgh, the latter having had the privilege of examining an abundant material.

I believe this remarkable form to be directly derived from relatives of *R. temporaria*. I have recently given my reasons for not accepting Van Denburgh's genus *Babina* (cf. *C.R. Ac. Sc. Paris*, clxv, 1917, p. 98).

63. *Rana curtipes*.

- Rana curtipes*, Jerdon, *Journ. As. Soc. Beng.* XXII, 1853, p. 532 ; Boulenger, *Cat. Batr. Ecaud.* p. 61 (1882), and *Faun. Ind., Rept.* p. 458 (1890) ; Rao, *Rec. Ind. Mus.* X, 1914, p. 265.

Pachybatrachus robustus, Mivart, *Proc. Zool. Soc.* 1868, p. 557. fig.

Clinotarsus robustus, Mivart, *Proc. Zool. Soc.* 1869, p. 227.

Hylorana curtipes, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83.

Vomerine teeth in oblique series or feeble groups on a level with the posterior borders of the choanae, sometimes very indistinct or absent.

Head large and strongly depressed, as long as broad or a little broader than long, broader than the body; snout rounded or obtusely pointed, moderately or feebly projecting, as long as or slightly longer than the eye; canthus rostralis distinct; loreal region oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or less than the interorbital width, which is equal to or greater than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to once the diameter of the eye, close to it or separated from it by a space not exceeding $\frac{1}{2}$ its diameter.

Fingers rather slender, swollen at the end, first longer than the second, third usually longer than the snout; subarticular tubercles large and very prominent.

Hind limb rather short and thin; tibio-tarsal articulation reaching the tympanum or the eye, heels meeting or feebly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length from snout to vent, much shorter than the fore limb, a little longer than the foot. Toes rather short, the tips dilated into very small discs which are longer than broad, with or without a feeble groove between the upper and the lower surface, $\frac{3}{4}$ to nearly entirely webbed, the web extending to the discs of the third and fifth, and penetrating about $\frac{2}{3}$ down between the outer metatarsals; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth; a narrow but rather prominent glandular dorso-lateral fold, from above the tympanum to the groin; another, oblique, behind the tympanum to above the fore limb; the distance between the dorso-lateral folds, or the sacral region, $\frac{1}{2}$ to $\frac{3}{4}$ the length of head and body.

Grey, pale brown, or crimson above, with or without scattered small black spots, the sides darker brown to black; a blackish oblique spot or band below the eye; the temporal region sometimes lighter than the sides behind it; upper lip with a blackish margin; limbs dark purplish brown, without cross-bands; light brown to dark brown beneath, black in the young.

Males with internal vocal sacs; the fore limb more robust; a small patch of grey velvety rugosities on the inner metacarpal tubercle and on the inner side of the first finger.

Nasal bones moderately large, separated from each other and from the ethmoid, which is exposed and truncate in front; frontoparietals broad and flat; zygomatic branch of the squamosal not longer than the posterior. Terminal phalanges feebly expanded at the end.

Tadpole remarkable for the presence of a more or less distinct oval parotoid gland on each side, which persists in the young and sometimes even in half-grown specimens; the tail obtusely pointed and about $1\frac{1}{2}$ times as long as the body. Beak edged with black; labial teeth in 8 upper and 8 lower series, the outer upper

marginal, followed by 2 uninterrupted series and 5 series on each side, the lower all long and uninterrupted or only the innermost narrowly interrupted; lower lip and sides of upper bordered by papillae. Dark brown, with small black spots on the tail.

Eggs very small, measuring 1 to $1\frac{1}{2}$ millim. in uterus of females 75 to 85 millim. long from snout to vent.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.
	♂	♂	♀	♀	♀	♀	♀	♀
From snout to vent	.. 55	42	76	75	64	85	75	63
Head ..	.. 21	15	27	26	24	27	25	22
Width of head ..	.. 21	15	30	27	24	31	28	25
Snout ..	.. 8	5	9	9	8	9	9	7
Eye ..	.. 7	5	9	9	8	9	9	7
Interorbital width	.. 4.5	4.5	8	8	6	9	9	6
Tympanum ..	.. 6	5	7	7	6	7	7	6
Fore limb ..	.. 35	28	48	47	43	53	47	42
First finger ..	.. 6	5	11	10	8	11	10	8
Second finger ..	.. 5	4.5	9	8	7	9	8	7
Third finger ..	.. 8	6.5	14	11	10	13	13	10
Fourth finger ..	.. 6	4.5	9	8	7	9	8	7
Hind limb ..	.. 74	55	109	105	89	115	105	88
Tibia ..	.. 23	17	34	33	28	37	33	28
Foot ..	.. 21	16	33	30	26	33	30	25
Third toe ..	.. 9	7	16	14	12	16	15	12
Fourth toe ..	.. 15	11	23	22	19	26	23	18
Fifth toe ..	.. 10	7	16	15	12	17	15	12

1-5. Malabar. 6. Sircee, S. Canara. 7. Piermerd, Travancore. 8. ? (type of *Pachybatrachus robustus*).

Habitat. Malabar hills, from Canara to Travancore.

This *Rana* is unlike any other in form, suggesting *Leptobranchium hasseltii*. It might as well be placed in the subgenus *Rana*, with which some specimens agree entirely in the shape of the toes, whilst others show a groove on the terminal discs, thus constituting a connecting link between the subgenera *Rana* and *Hylarana*. The presence of a parotoid gland in the larva and young is peculiar to some of the species included in the latter subgenus, e.g. *R. alticola*, and this consideration has determined its allocation. The coloration is also unique in the genus *Rana* in the upper parts being lighter than the lower, and in the temporal region being sometimes lighter than the sides, thus standing in comparison to *R. temporalis* like positive and negative in photography.

[The young frog of this species frequently attains a relatively large size before losing the vestiges of its tail. N. A.]

64. *Rana guentheri*.

Hylarana albolabris, part., Günth. *Cat. Batr. Sal.* p. 143 (1858).

? *Hylarana malabarica* (non D. et B.), Steind. *Novara, Amph.*, p. 48 (1867).

Rana guentheri, Bouleng. *Cat. Batr. Ecaud.* p. 48, pl. iv, fig. 2 (1882): Boettg. *Ber. Offenb. Ver. Nat.* 1888, p. 95; Bouleng. *Proc. Zool. Soc.* 1897, p. 481; Wolterst. *Abh. Mus. Magdeb.* I, 1906, p. 144.

Rana elegans, Bouleng. *Cat.* p. 59, pl. v, fig. 1.

Rana guentheri, part., Bouleng. *Ann. Mus. Genova* (2) XIII, 1893, p. 331.

Vomerine teeth in long and strong, more or less oblique series between the choanæ, touching the anterior corners of the latter.

Head much depressed, a little longer than broad; snout acutely or obtusely pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis distinct; loreal region moderately oblique, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{1}{2}$ the diameter of the eye, 2 to 3 times its distance from the latter.

Fingers rather long, the tips swollen, first longer than the second, third longer than the snout; subarticular tubercles rather large, prominent.

Hind limb long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to 5 times as long as broad, $1\frac{5}{8}$ to 2 times in length from snout to vent, shorter than the fore limb, as long as or a little longer or a little shorter than the foot. Toes rather long, the tips dilated into very small discs with a groove separating the upper from the lower surface, $\frac{3}{4}$ webbed, 2 phalanges of fourth free, the web reaching the discs of the third and fifth and penetrating almost to the base of the outer metatarsals; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; a very small and sometimes rather indistinct outer tubercle.

Skin smooth; a narrow or rather broad glandular dorso-lateral fold from above the tympanum to the groin, the distance between these folds $\frac{1}{2}$ to $\frac{1}{3}$ the length of head and body; another fold from below the eye to the shoulder. Lower parts smooth.

Greyish brown or reddish brown above, back uniform or with dark brown spots; a dark brown or black streak or band on each side of the head and back, passing through the eye and bordering the dorso-lateral fold; tympanum dark brown or reddish brown, edged with white in front and behind; limbs with dark cross-bands; hinder side of thighs marbled black and yellow. Lower parts white, throat or breast usually brown or mottled with brown.

Males with an external vocal sac on each side of the throat and a large flat gland at the base of the arm.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, which is largely exposed and truncate in front; zygomatic branch of squamosal rather long. Terminal phalanges feebly expanded at the end.

Measurements, in millimetres.

	1. ♀	2. ♀	3. ♂	4. ♂	5. ♀	6. ♂	7. ♂	8. ♀	9. ♀
From snout to vent ..	83	62	80	60	65	68	75	72	70
Head ..	27	22	27	22	21	23	26	23	23
Width of head ..	26	19	26	20	19	20	24	20	22
Snout ..	12	9	11	8	8	9	10	9	10

	1. ♀	2. ♀	3. ♂	4. ♂	5. ♀	6. ♂	7. ♂	8. ♀	9. ♀
Eye ..	9	7	9	7	7	7	8	8	8
Interorbital width ..	5	4	5	4	5	5	5	5	4
Tympanum ..	7	5.5	6	5	5	6	5	5	6
Fore limb ..	51	36	49	36	42	41	48	42	42
First finger ..	12	9	12	9	10	10	12	11	10
Second finger ..	10	8	10	7	8	8	10	9	9
Third finger ..	14	11	14	10	12	12	13	12	12
Fourth finger ..	10	7	10	7	9	8	9	9	9
Hind limb ..	125	107	126	101	109	112	124	115	115
Tibia ..	42	33	43	31	35	37	39	36	36
Foot ..	38	34	44	32	35	37	41	38	38
Third toe ..	24	18	25	18	19	20	23	20	21
Fourth toe ..	32	29	38	29	30	33	35	32	32
Fifth toe ..	27	21	27	20	22	23	25	22	22

1-2. Amoy (types). 3-5. Man Son Mts., Tonkin. 6. Chang Nam, Anam. 7-9 ? (types of *R. elegans*).

Habitat. China (Hong Kong, Canton, Amoy, Hainan, Sze Chuen), Tonkin, and Anam.

65. *Rana mortenseni*.

Rana guentheri, part., Bouleng. *Ann. Mus. Genova* (2) XIII, 1893, p. 331.

Rana mortenseni, Bouleng. *Ann. and Mag. N.H.* (7) XII, 1903, p. 219.

Rana nigrovittata (non Bouleng.), Malcolm Smith, *Journ. N. H. Soc. Siam*, II, 1916, p. 42, pl. —.

Vomerine teeth in small groups between the choanæ or short oblique series usually extending beyond the level of their posterior borders, nearer to each other than to the latter.

Head much depressed, as long as broad; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately oblique, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils greater than the interorbital width, which equals that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{5}{8}$ the diameter of the eye, 4 times its distance from the latter.

Fingers moderately long, the tips swollen, first longer than the second, third longer than the snout; subarticular tubercles rather large, prominent.

Hind limb long, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to 2 times in length from snout to vent, shorter than the fore limb, as long as or slightly longer than the foot. Toes rather long, the tips dilated into small discs with a groove separating the upper from the lower surface, $\frac{3}{4}$ to nearly entirely webbed, 1 or 2 phalanges of fourth free, the web reaching the discs of the third and fifth and penetrating almost to the base of the outer metatarsals; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; a small round outer tubercle.

Skin more or less distinctly granulate above, with or without small flat warts; a rather broad and very prominent glandular dorso-lateral fold from above the tympanum, sometimes interrupted on the iliac region; the distance between the folds, on the back, $\frac{1}{2}$ the distance from snout to vent; a second glandular fold from below the eye to the shoulder. Lower parts smooth.

Brown above, darker on the sides; a dark streak from the tip of the snout, through the eye, along the outer border of the dorso-lateral fold; limbs with dark cross-bands. Throat and breast brown, belly white.

Males with internal vocal sacs. Fore limbs strong and with an oval gland at the base of the arm; a strong pad on the inner side of the first finger.

Skull as in *R. guentheri*.

The tadpole has been described by Malcolm Smith as that of *R. nigrovittata*. Tail about twice as long as the body, bluntly pointed. Beak broadly edged with black and finely serrated; upper lip with a long continuous row of horny teeth, followed by a second row broadly interrupted by the beak; lower lip with 3 long rows of teeth, the innermost narrowly interrupted in the middle, and with a double row of papillæ.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.
	♂	♂	♀	♀	♂	♀
From snout to vent ..	61	71	68	67	50	50
Head ..	22	25	23	23	18	17
Width of head ..	22	25	23	23	18	17
Snout ..	7	9	8	8	6	6
Eye ..	7	9	8	8	6	6
Interorbital width ..	4	6	4	4	3	3
Tympanum ..	4	6	5	5	4	4
Fore limb ..	36	45	42	42	33	31
First finger ..	8	11	9	10	7	7
Second finger ..	6.5	9	8	8	6	6
Third finger ..	10	12	11	12	8	8
Fourth finger ..	6	8	6	7	6	5
Hind limb ..	100	124	110	114	80	81
Tibia ..	33	40	37	38	25	26
Foot ..	32	38	33	35	24	24
Third toe ..	17	21	17	18	12	12
Fourth toe ..	27	32	27	29	21	21
Fifth toe ..	18	22	18	21	15	14

1. Koh Chang Id., S.E. Siam (type). 2—4. Koh Chang Id. 5—6. N. Siam.

Habitat. Siam and Karin hills between Siam and Burma.

Distinguished from *R. guentheri* by the more posterior position of the vomerine teeth, the shorter snout, the larger discs of the toes, and the absence of external vocal sacs,

66. *Rana latouchii*.

Rana latouchii, Bouleng. *Proc. Zool. Soc.* 1899, p. 167, pl. xix, fig. 1, and *Ann. and Mag. N.H.* (8) IV, 1909, p. 495; Werner, *Mitth. Nat. Mus. Hamb.* XXX, 1913, p. 47.

Vomerine teeth in oblique groups or short series between the choanæ, extending more or less beyond the level of their posterior borders.

Head much depressed, as long as broad or slightly longer than broad; snout rounded or obtusely pointed, projecting more or less beyond the mouth, as long as or slightly shorter than the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril nearer the end of the snout than the eye; distance between the nostrils greater than the interorbital width, which equals or is a little less than that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye and 3 to 5 times its distance from the latter.

Fingers rather slender, with feebly swollen tips, first longer than the second, third much longer than the snout; subarticular tubercles large, very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, about twice in length from snout to vent, shorter than the fore limb, as long as or slightly shorter than the foot. Toes rather slender, the tips dilated into very small discs with a groove between the upper and the lower surface, $\frac{2}{3}$ to $\frac{3}{4}$ webbed, 2 or 3 phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderate, very prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; a very prominent, round outer tubercle.

Upper parts smooth or finely granulate, some males rough with small spinose tubercles; a very prominent and very broad glandular dorso-lateral fold, from above the tympanum, broken up behind the sacral region, its greatest width at least equal to that of the upper eyelid; the distance between the folds, on the back, $\frac{1}{4}$ to $\frac{1}{3}$ the length from snout to vent; two strong glands behind the angle of the mouth; lower parts smooth.

Greyish olive or pale brown above, uniform or with irregular darker spots; sides with black spots; a dark streak on the canthus rostralis and, usually, a dark temporal blotch, which may be continued along the side of the body; a white streak on the upper lip; limbs with dark cross-bands; hinder side of thighs with black spots. Lower parts white, uniform or with some greyish spots on the throat and breast.

Males with internal vocal sacs, with very thick fore limbs and a strong pad on the inner side of the first finger, covered with a yellowish velvet-like horny layer.

Nasal bones rather small, widely separated from each other and from the frontoparietals; ethmoid exposed in front. Terminal phalanges feebly expanded at the end.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.
	♂	♂	♀	♂	♂	♂	♂	♀
From snout to vent	.. 37	37	45	47	43	42	40	55
Head ..	.. 13	13	14	17	15	15	15	19
Width of head	.. 13	13	14	17	15	15	14	19
Snout ..	.. 4	4	5	6	5.5	5.5	5.5	6.5
Eye ..	.. 5	4.5	5	6	5.5	5.5	5.5	6.5
Interorbital width	.. 3	3	3.5	3.5	3	3.5	3	4.5
Tympanum ..	.. 2.5	2.5	3	3.5	3.5	3.5	3	4.5
Fore limb ..	.. 26	24	30	29	27	27	27	34
First finger ..	.. 5	4.5	7	7	5.5	6	5.5	8
Second finger	.. 4	4	5.5	5	4.5	5	4.5	6
Third finger ..	.. 7	6	8	8	7	7	7	10
Fourth finger	.. 4	3	5	5	4	4.5	4	5
Hind limb ..	.. 64	59	75	73	69	70	66	86
Tibia ..	.. 19	19	23	23	21	22	20	27
Foot ..	.. 21	19	24	24	22	22	21	27
Third toe ..	.. 11	10	13	13	12	12	12	14
Fourth toe ..	.. 18	17	20	20	19	19	17	22
Fifth toe ..	.. 11	10	13	14	13	12	12	15

1-3. Kuatun, Fokien (types). 4-8. Fuhosho, Formosa.

Habitat. China (N.W. Fokien) and Formosa.67. *Rana cubitalis*.*Rana cubitalis*, Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1917, p. 277.

Vomerine teeth in two short, slightly oblique series just behind the level of the choanæ, equally distant from them and from each other.

Head much depressed, as long as broad; snout obtusely pointed, strongly projecting beyond the mouth, a little longer than the eye; canthus rostralis strong; loreal region oblique, deeply concave; nostril equally distant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct, nearly as large as the eye and close to it.

Fingers rather slender, merely swollen at the end, first much longer than the second, third longer than the snout; subarticular tubercles moderately large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching a little beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $4\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ times in length from snout to vent, as long as the fore limb, longer than the foot. Toes moderately long, the tips dilated into small discs which are a little longer than broad, with a feeble groove between the upper and lower surface, extensively webbed, the membrane reaching the discs of the third and fifth but reduced to a narrow fringe on the penultimate phalanx of the fourth and separating the outer metatarsals down to their basal fourth; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle elliptic, $\frac{2}{3}$ the length of the first toe; a prominent outer tubercle.

Skin of upper parts rough with very small granules intermixed with small glands irregular in size; some of the glands confluent into longitudinal folds on the hind limbs; a moderately broad but very prominent glandular dorso-lateral fold from above the tympanum to the hip, somewhat broken up behind the sacral region; these folds, as well as the glands on the upper parts and on the sides of the belly, closely studded with very minute spinules. Lower parts smooth, with feebly prominent granules on the posterior part of the belly and of the thighs.

Light olive (in life, according to Malcolm Smith) above and on the sides, with an irregular chain of small black spots along each flank; a dark streak along the canthus rostralis and dark spots on the lips; tympanum dark brown; limbs with dark cross-bars; back of thighs marbled with dark brown. Lower parts whitish.

Male with internal vocal sacs and a round flat gland on each side of the breast, in front of the base of the arm; fore limb very strong, with a strong pad on the inner side of the first finger; this pad covered with fine velvet-like nuptial excrescences which extend as a broad band on the inner side of the fore-arm, expanding into a large round gland near its articulation with the arm.

Measurements of the type specimen, in millimetres.

From snout to vent	..	..	..	..	70
Head ..	..	..	..	..	22
Width of head ..	..	..	..	..	22
Snout ..	..	..	..	..	9
Eye ..	..	..	..	..	7
Interorbital width	..	..	..	..	4
Tympanum ..	..	..	..	..	6
Fore limb ..	..	..	..	..	47
First finger ..	..	..	..	..	9
Second finger ..	..	..	..	..	7
Third finger ..	..	..	..	..	13
Fourth finger ..	..	..	..	..	6
Hind limb ..	..	..	..	..	125
Tibia ..	..	..	..	..	41
Foot ..	..	..	..	..	37
Third toe ..	..	..	..	..	20
Fourth toe ..	..	..	..	..	32
Fifth toe ..	..	..	..	..	22

Habitat. Doi Nga Chang, N. Siam, at about 1600 ft. elevation. Described from the type specimen (male) presented by Dr. Malcolm Smith to the British Museum.

68. *Rana adenopleura*.

Rana adenopleura, Bouleng. *Ann. and Mag. N.H.* (8) IV, 1909, p. 492.

Vomerine teeth in small oblique groups between the choanæ, nearer to each other than to the latter.

Head as long as broad, moderately depressed; snout obtusely pointed, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril equidistant from the eye and from the tip of the snout;

distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{5}{8}$ the diameter of the eye and 2 to 4 times its distance from the latter.

Fingers rather slender, with slightly swollen tips, first a little longer than the second, third longer than the snout; subarticular tubercles strong, prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, a little less than twice in length from snout to vent, a little shorter than the fore limb, as long as the foot. Toes slender, the tips dilated into small discs with a groove separating the upper from the lower surface, $\frac{1}{2}$ to $\frac{3}{4}$ webbed, 2 or 3 phalanges of fourth free, the web separating the outer metatarsals almost to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, $\frac{1}{2}$ or $\frac{3}{4}$ the length of the inner toe; a more or less distinct, small, round outer tubercle.

Skin smooth; a moderately broad, very prominent glandular dorso-lateral fold from above the tympanum to the groin; the distance between the folds, or the back, $4\frac{1}{2}$ to $5\frac{1}{2}$ times in length from snout to vent.

Greyish brown above, with or without darker spots or marblings, with or without a light vertebral line; a more or less distinct dark band on each side of the head, passing through the eye; a whitish streak along the upper lip; dorso-lateral fold dark edged; limbs with dark cross-bars; hinder side of thighs yellowish, spotted or marbled with brown or black. Lower parts white, throat sometimes brownish.

Males with internal vocal sacs and a very large flat gland on each side above and behind the shoulder; first finger with a feeble pad on the inner side, covered with a velvet-like greyish layer.

Nasal bones large and in contact with each other, separated from the frontoparietals, which do not cover the ethmoid in front; zygomatic branch of squamosal not longer than the posterior. Terminal phalanges with feeble transverse expansion.

Measurements of type specimens, in millimetres.

			1.	2.	3.	4.
			♂	♂	♂	♀
From snout to vent	..	..	52	52	52	55
Head ..	..	..	18	18	18	18
Width of head ..	..	..	18	18	18	18
Snout ..	..	..	6	6	6	6
Eye ..	..	..	6	6	6	6
Interorbital width	..	..	3	3	3	3
Tympanum ..	..	..	5	4	4	4
Fore limb ..	..	..	33	31	31	32
First finger ..	..	..	6.5	6	6	7
Second finger ..	..	..	6	5.5	5.5	6
Third finger ..	..	..	10	9	9	10
Fourth finger ..	..	..	5	5	5	6

				1.	2.	3.	4.
				♂	♂	♂	♀
Hind limb	..	..	..	87	87	91	89
Tibia ..	..	..	..	28	27	29	28
Foot ..	..	..	..	28	27	29	28
Third toe	..	..	..	16	15	17	16
Fourth toe	..	..	..	25	24	25	24
Fifth toe	..	..	..	17	15	18	16

Habitat. Fudacho village, Formosa, altitude about 4,000 feet.

But for the digital dilatations this species resembles very closely *R. pleuraden*, from which it is probably derived.

69. *Rana gracilis*.

Rana gracilis, Gravenh. *Delic. Mus. Zool. Vratisl.* p. 45, pl. viii, fig. 3 (1829); Bouleng. *Faun. Ind., Rept.* p. 456 (1890); W. Sclater, *Proc. Zool. Soc.* 1892, p. 345.

Limnodytes macularius, Blyth, *Journ. As. Soc. Beng.* XXIII, 1854, p. 299.

Rana malabarica, part., Günth. *Cat. Batr. Sal.* p. 11 (1858).

Hylorana macularia, Günth. *Rept. Brit. Ind.* p. 425, pl. xxvi, fig. c (1864).

Rana macularia, Bouleng. *Cat. Batr. Ecaud.* p. 60 (1882).

Vomerine teeth in short oblique series between the choanæ, nearer to each other than to the latter.

Head moderately depressed, as long as broad or longer than broad; snout obtusely pointed, projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region feebly oblique or nearly vertical, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{5}{8}$ the diameter of the eye, close to it or separated from it by a space not exceeding $\frac{1}{3}$ its diameter.

Fingers long and slender, merely swollen at the end, first longer than the second, third much longer than the snout; subarticular tubercles large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{3}$ to $1\frac{2}{3}$ times in length from snout to vent, shorter than the fore limb, as long as or slightly shorter than the foot. Toes long and slender, the tips dilated into very small discs, which are a little longer than broad and with a groove separating the upper from the lower surface, $\frac{1}{2}$ webbed, 3 phalanges of fourth and 2 of third and fifth free; outer metatarsals separated by web nearly to the base; subarticular tubercles rather small but very prominent; no tarsal fold; inner metatarsal tubercle oval, $\frac{1}{4}$ to $\frac{1}{3}$ the length of the inner toe; a round outer metatarsal tubercle.

Skin smooth or feebly granulate above; a moderate or rather broad glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the dorso-lateral folds, on the back, $\frac{1}{3}$ to $\frac{1}{2}$ the length of head and body; another glandular fold from

below the eye to the groin, sometimes broken up on the body. Lower parts smooth.

Pale brown above, sides of head and body dark brown; some dark brown or black spots on the middle of the back, sometimes confluent into a vertebral band bifurcating on the sacral region; dorso-lateral glandular folds pale brown or whitish, edged with a black streak which extends to the tip of the snout; tympanum often reddish brown; upper lip and lateral glandular fold white; no dark cross-bars on the limbs, but sometimes a blackish streak along the outer side of the tibia; hinder side of thighs marbled black and white. Lower parts white, sometimes spotted with brown on the throat.

Males with not much developed external vocal sacs below the angles of the mouth.

Nasal bones small and narrow, separated from each other and from the frontoparietals; ethmoid largely exposed above, pointed and produced between the nasals; zygomatic branch of squamosal not longer than the posterior. Terminal phalanges feebly expanded at the end.

Eggs small, $1\frac{1}{2}$ millim. in diameter.

Measurements, in millimetres.

	1.	2.	3.	4.	5.
	♂	♀	♀	♀	♀
From snout to vent ..	50	64	60	47	41
Head ..	18	22	19	16	15
Width of head; ..	16	19	19	15	14
Snout ..	7	9	7	6	6
Eye ..	6	7	6	6	6
Interorbital width ..	4	5	4	4	3
Tympanum ..	5	5	5	4	4
Fore limb ..	33	40	40	32	27
First finger ..	8	10	10	7	6
Second finger ..	6.5	8	8	6	5
Third finger ..	10	12	12	9	8
Fourth finger ..	6	7	8	6	5
Hind limb ..	90	105	109	91	73
Tibia ..	28	34	34	28	24
Foot ..	29	34	35	29	25
Third toe ..	15	18	19	15	13
Fourth toe ..	24	29	29	24	21
Fifth toe ..	16	22	21	16	14

1-4. Ceylon. 5. Diyatalawa, Ceylon.

Habitat. Ceylon.

70. *Rana elberti*.

Rana elberti, Roux, *Zool. Jahrb., Syst.* XXX, 1911, p. 504.

Vomerine teeth in oblique groups between the choanæ and extending somewhat beyond the level of their posterior borders, nearer to each other than to the latter.

Head as long as broad, less depressed than in *R. varians*; snout truncate, feebly projecting beyond the lower jaw, as long as the eye; canthus rostralis rounded; loreal region vertical, feebly concave; nostril nearer the tip of the snout than the eye; interorbital

space as broad as the upper eyelid; tympanum $\frac{3}{4}$ the diameter of the eye, close to it.

Fingers moderately long, the tips feebly dilated, without distinct discs, first longer than the second.

Hind limb long and slender, tibio-tarsal articulation reaching beyond the tip of the snout; tibia $\frac{3}{4}$ the length of head and body. Toes nearly entirely webbed, the tips dilated into small but distinct discs; subarticular tubercles prominent; no tarsal fold; inner metatarsal tubercle oval, prominent; a smaller, oval outer tubercle.

Skin of upper parts smooth or rather rough; a very narrow dorso-lateral fold. Lower parts smooth.

Uniform olive above; a rather broad brown streak below the canthus rostralis; a large brown temporal spot; limbs with brown cross-bands; hinder side of thighs with large black spots in a white network. Lower parts uniform yellowish white.

From snout to vent 48 millim.

Habitat. Iliwaki Island, Sunda Islands.

This species has been compared with *R. florensis* and *R. varians* but it appears to me, judging from the description, to be more nearly allied to *R. guentheri* and *R. gracilis*.

71. *Rana sauteri*.

Rana sauteri, Bouleng. *Ann. and Mag. N.H.* (8) IV, 1909, p. 493.

Vomerine teeth in strong oblique series originating between the choanæ and extending considerably beyond the level of their posterior borders.

Head as long as broad, much depressed; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region not very oblique, slightly concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{5}{8}$ the diameter of the eye, and 2 to 4 times its distance from the latter.

Fingers rather slender, with distinctly swollen tips, first as long as the second, third longer than the snout; subarticular tubercles strong, very prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $4\frac{1}{2}$ to $5\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to $1\frac{5}{8}$ times in length from snout to vent, a little shorter than the fore limb, slightly longer than the foot. Toes slender, the tips dilated into small discs with a groove separating the upper from the lower surface, $\frac{3}{4}$ webbed, the web extending to the discs of the fourth and fifth, leaving 2 phalanges of fourth free, and separating the outer metatarsals almost to the base; subarticular tubercles large and prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; a small round outer tubercle.

Skin smooth or finely shagreened above; a very narrow glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the folds, on the back, $\frac{1}{7}$ to $\frac{1}{8}$ the length of head and body. Lower parts smooth.

Pale grey or greyish brown above, uniform or with small brown or black spots; a more or less distinct dark bar between the eyes; sometimes a dark \wedge between the shoulders; a dark brown or black canthal streak and a large temporal spot of the same colour involving the tympanum; limbs with dark cross-bars. Lower parts white, throat and breast closely spotted or marbled with grey or brown.

Male unknown.

Nasal bones rather small, oblique, separated from each other and from the frontoparietals, which do not cover the ethmoid in front.

Measurements of types, in millimetres.

From snout to vent	..	..	57	55	54	46
Head ..	..	..	19	18	18	16
Width of head ..	..	..	19	18	18	16
Snout ..	..	..	6	6	6	5
Eye ..	..	..	6	6	6	5
Interorbital width	..	..	3.5	3.5	3.5	3
Tympanum ..	..	..	4	5	4	4
Fore limb ..	..	..	36	36	33	27
First finger ..	..	..	6	6	6	5
Second finger ..	..	..	6	6	6	5
Third finger ..	..	..	8	9	8	7
Fourth finger ..	..	..	6	6	6	5
Hind limb ..	..	..	100	98	94	80
Tibia ..	..	..	33	32	31	26
Foot ..	..	..	32	31	29	24
Third toe ..	..	..	17	17	16	13
Fourth toe ..	..	..	25	25	24	20
Fifth toe ..	..	..	19	19	18	16

Habitat. Kanshirei Village, Formosa, about 2,000 feet.

But for the less oblique loreal region and the dilated toes, this species resembles strikingly *R. japonica*.

72. *Rana nigrovittata*.

Limnodytes nigrovittatus, Blyth, *Journ. As. Soc. Beng.* XXIV, 1855, p. 718.

Rana nigrovittata, part., W. Sclater, *Proc. Zool. Soc.* 1892, p. 345.

Rana nigrovittata, Bouleng. *Ann. Mus. Genova* (2), XIII, 1893, p. 334, and *Ann. and Mag. N.H.* (7), XII, 1903, p. 186; S. Flower, *Proc. Zool. Soc.* 1899, p. 896; Bouleng. *Faun. Mal. Pen., Rept.* p. 242 (1913); Annand. *Mem. As. Soc. Beng.* VI, 1917, pp. 140, 144.

Vomerine teeth in oblique groups or short series on a level with or just behind the posterior borders of the choanæ, equally distant from each other and from the latter, or nearer each other.

Head as long as broad, much depressed; snout rounded or obtusely pointed, more or less projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region feebly oblique or nearly vertical, deeply concave; nostril equally distant from the eye and from the end of the snout or a little nearer the

latter; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{3}{8}$ to $\frac{5}{8}$ the diameter of the eye, $1\frac{1}{2}$ to 3 times as long as its distance from the latter.

Fingers moderately long, with the tips swollen into very small discs which do not bear a groove; first finger a little longer than the second, third longer than the snout; subarticular tubercles large, very prominent.

Hind limb moderate or rather long, the tibio-tarsal articulation reaching the eye, the nostril, or between these two points, the heels overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ to 4 times as long as broad, $1\frac{1}{4}$ to 2 times in length from snout to vent, shorter than the fore limb, as long as or a little longer than the foot. Toes with small discs, more developed than those of the fingers and bearing a groove separating the upper from the lower surface, the web reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; no tarsal fold; subarticular tubercles strong; inner metatarsal tubercle oval, prominent, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; a very prominent, round outer tubercle.

Skin smooth or granulate above, often warty on the sides; a rather broad and prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, $4\frac{1}{2}$ to $5\frac{1}{2}$ times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by a glandule. Lower parts smooth.

Brown above, with or without darker spots; a dark brown or blackish band on each side of the head and body, bordering the canthus rostralis and the dorso-lateral fold; a whitish streak along the upper lip and the glands behind it; limbs with dark cross-bands; hinder side of thighs yellowish, with black spots or marblings. Lower parts white, often with small brown spots; throat usually brown.

Males with internal vocal sacs and a moderately large gland on the inner side of the arm.

Nasal bones rather small, separated from each other and from the frontoparietals; ethmoid exposed above, pointed in front, extending to the line of the posterior borders of the nasals.

Eggs measuring $1\frac{1}{2}$ millim. in diameter in a female 54 millim. long from snout to vent.

73. *Rana leptoglossa*.

Hylorana leptoglossa, Cope, *Proc. Ac. Philad.* 1868, p. 139.

Hylorana granulosa, Anders. *Journ. As. Soc. Beng.* XI, 1871, p. 23.

Rana granulosa, W. Sclater, *Proc. Zool. Soc.* 1892, p. 346; Boulenger, *Ann. Mus. Genova* (2) XIII, 1893, p. 333, pl. viii, fig. 2; Annand, *Rec. Ind. Mus.* VIII, 1912, p. 9, and *Mem. As. Soc. Beng.* VI, 1917, pp. 140, 142.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	
From snout to vent	♂	♂	♂	♂	♂	♀	♀	♀	♀	♂	♂	♂	♂	♀	♀	♀	♀	♂	♂	♀	♂	♀	♀	♀	
Head	..	46	46	44	43	37	50	49	45	40	51	47	44	40	55	54	44	42	45	50	74	50	49	42	50
Width of head	..	16	16	16	16	14	17	17	16	14	18	17	16	14	19	18	15	14	16	17	26	19	19	15	17
Snout	..	16	16	16	16	14	17	17	16	14	18	17	16	14	19	18	15	14	16	17	26	19	19	15	17
Eye	..	5.5	5	5.5	5	5	7	6	6	5	6	6	5	4.5	7	6	5.5	5	5	6	9	6.5	6.5	5.5	7
Interorbital width	5.5	5	5.5	5	7	6	6	5	6	6	5	4.5	7	6	5.5	5	5	6	9	6.5	6.5	5.5	7
Tympanum	3	3.5	3	3	4	3	4	3	4	4	3	3	4	4	3	3	3	4	6	4	5	3.5	4
Fore limb	4	4	4	3.5	3.5	4	4	4	3.5	5	4	3.5	5	4.5	4	3.5	3.5	4	7	5	5	3.5	5
First finger	30	28	27	26	24	30	28	24	33	28	27	25	34	33	27	26	28	30	46	31	32	28	30
Second finger	6.5	6	6	6	5	7	7	5	7	6	6	5	7	7	6	5	6	7	11	7	7	6	7
Third finger	5.5	5	5	5	4	6	6	5	7	6	5	4.5	6	6	5	4	5	6	9.5	6	6	5	6
Fourth finger	8	7	7	7	6	8	8	6	9	7	8	6.5	9	9	7	7	8	9	13	9	9	8	9
Hind limb	5	5	5	5	4	5	5	4	5	5	5	4	6	6	5	4	5	6	8	6	6	5	6
Tibia	73	69	72	68	61	79	76	63	85	73	71	63	89	84	72	66	73	81	7	85	81	73	80
Foot	24	23	23	22	19	26	25	20	28	25	24	20	28	27	23	21	24	26	41	28	26	23	27
Third toe	23	22	23	22	19	24	23	19	27	23	21	20	27	26	22	21	22	25	38	27	26	22	24
Fourth toe	14	12	12	11	10	13	12	13	11	14	12	11	14	14	12	11	12	14	21	15	14	13	12
Fifth toe	20	19	20	18	15-21	19	20	17	22	18	17	16	23	22	17	17	18	21	33	23	23	19	20
	15	14	14	12	11	15	14	12	16	13	12	12	16	15	13	12	14	16	24	16	15	14	14

1-9. Man Son Mts., Tonkin. 10-17. Dong Phya Fai, Siam. 18-19. Klong Bang Lai, Siam. 20. Koh Chung Id., S.E. Siam. 21-22. Slope of Byinzyi Mts., W. Karenni, Burma. 23. Karenni hills, Burma. 24. Mergui, Tenasserim.

19. Man Son Mts., Tonkin. 10-17. Dong Phya Fai, Siam. 18-19. Klong Bang Lai, Siam. 20. Koh Chung Id., S.E. Siam. 21-22. Slope of Byinzyi Mts., W. Karenni, Burma. 23. Karenni hills, Burma. 24. Mergui, Tenasserim.

Vomerine teeth in short transverse or oblique series between the choanæ, sometimes extending a little beyond the level of their posterior borders, equally distant from each other and from the choanæ, or nearer to each other.

Head as long as broad or a little longer than broad, much depressed; snout a little longer than the eye, rounded or obtusely pointed and prominent; canthus rostralis obtuse; loreal region feebly oblique, deeply concave; nostril a little nearer the end of the snout than the eye; distance between the nostrils equal to the interorbital width, which nearly equals that of the upper eyelid; tympanum very distinct; $\frac{3}{4}$ to nearly once the diameter of the eye, 3 to 8 times as long as its distance from the latter.

Fingers rather long, with very small discs without or with a very indistinct transverse groove; first finger much longer than the second, third longer than the snout; subarticular tubercles large, very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{4}$ to 2 times in length from snout to vent, shorter than the fore limb, as long as or slightly longer than the foot. Toes with small discs more developed than those of the fingers, bearing a groove separating the upper from the lower surface, $\frac{1}{2}$ to $\frac{3}{4}$ webbed, the web not quite reaching the discs of the third and fifth, 3 phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles strong; no tarsal fold; inner metatarsal tubercle oval, about $\frac{1}{3}$ the length of the inner toe; a very prominent, round outer tubercle.

Skin strongly granulate on the head and back, often with larger warts on the sides; a strong and broad glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow 5 to 6 times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by a glandule. Lower parts smooth.

Brown above, with small or large black spots or marblings; sides sometimes black, with white spots or marblings; loreal and temporal regions dark brown or black, tympanum reddish brown; canthus rostralis, dorso-lateral fold, and upper lip white; limbs with blackish cross-bands; hinder side of thighs marbled black and white. Lower parts white, spotted or marbled with brown.

Males with a large, greyish external vocal sac on each side below the mandible, extending from below the centre of the eye to the fore limb; a large gland on the inner side of the arm.

Nasal bones small, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, truncate in front, not extending to between the nasals.

Measurements, in millimetres.

		1. ♀	2. ♂	3. ♂	4. ♂	5. ♂	6. ♀
From snout to vent	..	61	60	60	53	51	57
Head	..	22	22	22	19	19	20
Width of head	..	20	21	21	18	18	18
Snout	..	8	8	8	7	7	7
Eye	..	7	7	7	6.5	6.5	6
Interorbital width	..	4	4	4	3	3	4
Tympanum	..	5.5	6	6	5	5	5
Fore limb	..	37	37	38	35	35	37
First finger	..	9	9	10	8.5	8	9
Second finger	..	7	7	7.5	6	6	7
Third finger	..	10	10	11	9	9	10
Fourth finger	..	7	7	7	6	6	7
Hind limb	..	103	93	95	83	85	95
Tibia	..	32	30	30	26	26	31
Foot	..	32	28	29	26	26	29
Third toe	..	17	16	16	14	15	15
Fourth toe	..	28	24	25	23	23	25
Fifth toe	..	20	17	18	15	15	17

1. Sibsagar, Assam. 2-5. Karenni hills, Burma. 6. Mt. Mooleyit, Tenasserim.

Habitat. Assam and Burma.

I have little hesitation in recognizing in Cope's *H. leptoglossa*, from Rangoon, Burma (Theobald collection), Anderson's *H. granulosa*. Cope's definition, including the "tongue narrow, not filling rami of jaws" (not a specific character) applies sufficiently well to some of our specimens, which is not the case if we compare it with Annandale's account of his *R. leptoglossa*, which I refer to the synonymy of *R. alticola*.

Since writing the above, I have asked Dr. T. Barbour to be so kind as to examine the types of *Hylorana*¹ *leptoglossa* in the Museum of Comp. Zoology, Cambridge, Mass. He writes (May 1, 1918) that these are badly preserved but agree well with my figure of *R. granulosa* in the Annals of the Genoa Museum. "The back is slightly granular and there is no sign whatever of a white mark directed upwards between the eye and the tympanum as shown by Annandale." He adds, "I think there is no possible question as to the fact that *leptoglossa* will have to replace *granulosa* as the specific name."

74. *Rana humeralis*.

Rana humeralis, Bouleng. *Ann. Mus. Genova* (2) V, 1887, p. 420, pl. iv, fig. 1, and *Faun. Ind., Rept.* p. 460 (1890).

Vomerine teeth in strong oblique series between the choanæ, nearly touching the anterior corners of the latter.

Head as long as broad, much depressed; snout obtusely pointed, projecting beyond the mouth, longer than the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals that of the upper eyelid; tympanum very distinct, about $\frac{1}{4}$ the diameter of the eye, twice its distance from the latter.

Fingers long and rather slender, with a distinct dermal border, the tips dilated into very small discs, which are longer than broad, with a horseshoe-shaped groove between the upper and the lower surface; first finger longer than the second, third shorter than the snout; subarticular tubercles strong, prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, a little more than half the length of head and body, shorter than the fore limb or than the foot. Toes long, with the tips dilated like those of the fingers, nearly entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles moderate, prominent; no tarsal fold; inner metatarsal tubercle oval, moderately prominent, $\frac{1}{3}$ the length of the inner toe; no outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold from above the tympanum to the hip; another from below the eye to the shoulder, followed by a prominent glandule.

Grey-brown or pale olive above, greenish on the flanks, glandular dorso-lateral folds not lighter; loreal and temporal regions usually darker; upper lip whitish; no cross-bands on the limbs; hinder side of thighs blackish, or marbled with blackish. Lower parts white.

Male with an external vocal sac on each side of the throat, and a large oval gland on the arm; a moderately large pad on the inner side of the first finger.

Measurements of types, from Teinzo, in millimetres.

				1.	2.
				♂	♀
From snout to vent	..	..	..	71	73
Head	..	..	..	24	24
Width of head	..	..	..	24	24
Snout	..	..	..	11	10
Eye	..	..	..	8	8
Interorbital width	..	..	..	5	5
Tympanum	..	..	..	5.5	5.5
Fore limb	..	..	..	45	50
First finger	..	..	..	10	11
Second finger	..	..	..	9	10
Third finger	..	..	..	14	15
Fourth finger	..	..	..	10	11
Hind limb	..	..	..	123	127
Tibia	..	..	..	37	40
Foot	..	..	..	40	43
Third toe	..	..	..	22	25
Fourth toe	..	..	..	33	36
Fifth toe	..	..	..	26	27

Habitat. Bhamo and Teinzo, Upper Burma.

75. *Rana miopus*.

Rana humeralis (non Bouleng.), Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1916, p. 167.

Rana miopus, Bouleng. *Journ. N.H. Soc. Siam*, III, 1918, p. 11.

Vomerine teeth in strong slightly oblique series between the choanæ, nearly touching the anterior corners of the latter.

Head as long as broad, much depressed; snout obtusely pointed, feebly projecting beyond the mouth, slightly longer than the eye; canthus rostralis obtuse; loreal region oblique, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils a little greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ the diameter of the eye, 3 times its distance from the latter.

Fingers moderately long, the tips dilated into very small discs, which are longer than broad, with a horseshoe-shaped groove between the upper and the lower surface; first finger much longer than the second, nearly as long as the third, which is longer than the snout; subarticular tubercles strong, very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the centre of the eye, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, a little less than half the length of head and body, shorter than the fore limb, a little longer than the foot. Toes with very small discs, $\frac{2}{3}$ webbed; outer metatarsals separated nearly to the base; subarticular tubercles large, very prominent; no tarsal fold; inner metatarsal tubercle elliptic, very prominent, slightly compressed, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold from above the tympanum to the hip; another from below the eye to the shoulder.

Grey above, uniform or blotched with pink and blackish; loreal and temporal regions darker; upper lip white; limbs with rather indistinct dark cross-bands; groin and hinder side of thighs black, speckled or vermiculate with white; lower parts white. Young pinkish grey above, with the canthus rostralis, the superciliary edge and the dorso-lateral fold bright pink, the side of the head and body black.

Secondary sexual characters of male apparently as in *R. humeralis*.

Measurements of type, in millimetres.

	♀
From snout to vent	73
Head	25
Width of head	25
Snout	9
Eye	8
Interorbital width	5
Tympanum	6
Fore limb	46
First finger	11
Second finger	8
Third finger	12
Fourth finger	7
Hind limb	108
Tibia	35
Foot	33
Third toe	16
Fourth toe	27
Fifth toe	18

Habitat. Peninsular Siam (Khao Bang Lai and Nakon Sita-marat).

Distinguished from *R. humeralis* by the shorter limbs, the much shorter and less strongly webbed foot, the proportions of the fingers, the more oblique loreal region, and the narrower inter-orbital space.

76. *Rana oatesii*.

Rana oatesii, Bouleng. *Ann. and Mag. N.H.* (6) IX, 1892, p. 141, pl. ix.

Vomerine teeth in strong oblique series on a level with the anterior borders of the choanæ, nearly touching the latter.

Head longer than broad, much depressed; snout pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis obtuse; loreal region feebly oblique, deeply concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, or the width of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye, $2\frac{1}{2}$ to 4 times its distance from the latter.

Fingers long and slender, the tips dilated into scarcely developed discs with a groove separating the upper from the lower surface; first finger longer than the second, third a little longer than the snout; subarticular tubercles moderately developed.

Hind limb rather long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $\frac{1}{2}$ or a little more than $\frac{1}{2}$ the length of head and body, shorter than the fore limb, as long as the foot. Toes with the tips dilated into very small discs, same as the fingers, nearly entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles small, feebly prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{1}{4}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin finely granulate above; a prominent glandular dorso-lateral fold from above the tympanum to the hip, about half as broad as the upper eyelid; the distance between these folds, on the back, 6 times in length of head and body; another glandular fold from below the eye to the shoulder, followed by a prominent glandule. Lower parts smooth.

Black above, uniform or marbled with pale brown, and with five whitish streaks, the middle extending from between the nostrils to above the vent, the upper pair running along the glandular lateral folds, the lower pair from the end of the snout along the upper lip, which is edged with brown, to the groin; sides of upper surface of snout and upper eyelids pale brown; limbs pale bronzy brown, with small black spots or marblings, which are confluent into longitudinal streaks on the sides of the tibia; hinder side of thighs black, spotted or marbled with white. Lower parts white, uniform or spotted with brown.

Males with a large, blackish external vocal sac on each side below the mandible, extending from below the centre of the eye to the fore limb; a large oval gland on the arm.

Measurements of types, in millimetres.

	♂	♂	♀	♀
From snout to vent	80	63	78	50
Head	26	22	27	18
Width of head	24	19	24	16
Snout	11	9	12	7
Eye	8	7	8	6
Interorbital width	5	4	5	3.5
Tympanum	6	5.5	6	4
Fore limb	49	40	49	32
First finger	11	9	12	7.5
Second finger	9	8	10	6
Third finger	14	11	14	9
Fourth finger	8	7	10	6
Hind limb	126	101	125	83
Tibia	40	32	39	25
Foot	40	32	39	25
Third toe	22	18	22	15
Fourth toe	36	28	35	22
Fifth toe	21	20	26	17

Habitat. Toungoo, Burma.

Differs from *R. humeralis* in the much smaller digital discs, in which respect, as well as in the coloration, it resembles *R. macrodactyla*.

77. *Rana erythræa*.

Hyla erythræa, Schleg. *Abbild.* p. 27, pl. ix, fig. 3 (1837).*

Hylarana erythræa, Tschudi, *Class. Batr.* pp. 37, 78 (1838); Günth. *Cat. Batr. Sal.* p. 73 (1858), *Rept. Brit. Ind.* p. 425 (1864); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 104; Anders. *Anat. Zool. Res. Yunnan*, p. 846 (1879).

Limnodytes erythræus, Dum. et Bibr. *Exp. Gén.* VIII, p. 511, pl. lxxxviii, fig. 1 (1841); Cantor. *Cat. Mal. Rept.* p. 141 (1847).

Hylarana tytleri, Theob. *Cat. Rept. As. Soc. Mus.* p. 84 (1868).

Rana erythræa, Bouleng. *Cat. Batr. Ecaud.* p. 63 (1882); *Ann. and Mag. N.H.* (5) XIV, 1884, p. 287, and *Faun. Ind., Rept.* p. 460 (1890); W. Slater, *Proc. Zool. Soc.* 1892, p. 345; Werner, *Fahresb. Nat. Ver. Magdeb.* 1892, p. 253, and *Verh. zool.-bot. Ges. Wien.* XLIII, 1893, p. 357; S. Flower, *Proc. Zool. Soc.* 1896, p. 902, pl. xlv, fig. 2, and 1899, p. 895; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885; A. L. Butler, *Fourn. N.H. Soc. Bomb.* XV, 1903, p. 198; van Kampen, in M. Weber, *Zool. Ergebn. Nied. O.-Ind.* IV, p. 390 (1907), and *Nat. Tijdschr. Ned. Ind.* L. XIX, 1909, p. 35; Bouleng. *Faun. Mal. Pen., Rept.* p. 241 (1912); Malcolm Smith, *Fourn. N.H. Soc. Siam*, II, 1917, p. 267.

Rana taipehensis, Van Denb. *Pröd. Cal. Ac.* III, 1909, p. 56.

Rana tytleri, part., Annand. *Mem. As. Soc. Beng.* VI, 1917, p. 141.

Vomerine teeth in short transverse or oblique series between the choanæ, equally distant from each other and from the choanæ or a little nearer the latter.

Head longer than broad, much depressed; snout more or less pointed, more or less projecting beyond the mouth, usually longer than the eye; canthus rostralis strong; loreal region very feebly oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to nearly once the diameter of the eye, 2 to 4 times its distance from the latter.

Fingers rather slender, the tips dilated into small discs, which are longer than broad and bear a groove separating the upper from the lower surface; a more or less distinct lateral dermal margin; first finger as long as or a little longer than the second, third longer than the snout; subarticular tubercles rather large and prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the eye or the tip of the snout, or between these two points, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to 2 times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot. Toes rather slender, with discs same as those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free; the web shorter in the young; outer metatarsals separated nearly to the base; subarticular tubercles rather large and prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, $\frac{1}{4}$ to $\frac{1}{3}$ the length of the inner toe; a small outer tubercle very rarely present.

Skin smooth; a broad and prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, $5\frac{1}{2}$ to 7 times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by a gland situated a little higher up and sometimes continued as an interrupted lateral fold.

Bright green, dull green, or yellowish brown above, rarely with a very narrow light vertebral streak; a dark brown stripe, generally darker or black at the edges, along each side of the head and body; tympanum usually reddish brown; dorso-lateral fold white or yellowish white, sometimes with a black streak or broad band on the inner side; a white or yellowish streak on the upper lip and another from the shoulder to the groin; limbs reddish-buff or yellowish brown, without dark cross-bands, often speckled or finely streaked with dark brown. Lower parts white; often a blackish line along the lower lip.

Males with internal vocal sacs and stronger fore limbs.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals, which are broad and flat; ethmoid largely uncovered, truncate in front, not produced between the nasals; zygomatic process of squamosal short. Terminal phalanges feebly expanded at the end.

The tadpole has been described by van Kampen. Tail about twice as long as body, pointed. Beak narrowly edged with black; a single, marginal, series of upper labial horny teeth, and two series of lower labials, the outer uninterrupted, the inner narrowly interrupted in the middle. Large specimens (body 18 millim., tail 40) have three white streaks along the body.

Habitat. Lower Bengal, Assam, Yunnan, Burma, Siam, Cochin-China, Malay Peninsula and Archipelago as far East as Celebes.

I cannot regard *R. taipehensis*, Van Denb., from Formosa, as more than a variety of *R. erythraea*. The two specimens which the

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	
From snout to vent	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♂	♀	♀	♂	♂	♂	♀	♀	♂	♂	♀	♀	♀	♂	♀	♀	♀	
Head	..	58	73	68	58	68	75	78	69	66	65	55	40	67	60	39	37	37	41	63	38	37	63	63	69	40	67	55	58
Width of head	..	19	23	23	21	23	24	27	24	23	23	20	16	25	21	15	15	14	16	22	14	14	22	21	24	15	23	19	21
Snout	..	17	20	21	19	20	22	25	20	21	20	17	13	22	19	13	13	13	19	12	12	19	19	21	12	21	16	19	
Eye	..	9	10	9	8	10	10	12	10	9	10	8	6	10	8	6	6	5	6	9	5	5	9	8	10	6	10	8	8
Interorbital width	..	6	7	7	6	7	7	8	7	7	7	6	5	7	6	5	5	5	5	5	5	7	7	8	5	7	6	7	
Tympanum	..	4	5	5	4	4	5	5	5	5	4	4	3	4	4	2	5	2	5	3	5	3	5	4	5	3	5	4	4
Fore limb	..	5	6	5	4	5	6	6	6	5	5	5	5	5	5	4	4	4	5	6	4	4	5	5	6	4	6	5	6
First finger	..	37	42	46	38	45	46	52	43	46	42	37	26	43	40	26	26	25	27	37	25	25	40	38	45	28	48	35	37
Second finger	..	8	5	10	9	10	10	11	10	10	9	8	5	10	9	5	5	5	5	5	5	5	9	9	10	6	10	8	8
Third finger	..	7	5	9	9	9	10	10	9	10	8	8	5	9	8	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Fourth finger	..	11	12	15	13	14	15	16	14	15	12	11	8	13	12	7	7	7	8	12	7	8	13	12	14	9	15	12	12
Hind limb	..	7	9	10	9	10	10	11	10	10	9	8	5	10	9	5	5	5	5	5	5	5	9	9	10	6	10	8	8
Tibia	..	95	115	118	100	111	120	133	114	115	105	96	62	113	112	62	61	62	65	107	65	63	107	102	117	70	121	92	98
Foot	..	30	37	37	32	37	38	40	35	36	34	30	20	36	34	20	20	20	21	34	20	20	33	32	36	22	39	30	31
Third toe	..	32	39	39	34	38	40	45	38	39	34	31	21	37	35	22	21	21	23	35	21	21	35	34	39	24	41	31	33
Fourth toe	..	17	22	22	19	21	24	24	22	22	18	17	12	20	18	13	12	12	13	20	12	11	20	19	22	14	24	17	19
Fifth toe	..	27	35	35	29	33	35	39	33	34	29	26	18	33	30	19	18	18	19	30	18	17	30	29	34	20	35	26	29
	..	20	25	26	22	25	26	30	25	26	23	21	13	23	22	14	14	14	14	12	13	12	24	23	26	16	27	20	22

1. Bangkok, Siam. 2. Paknam Kabin, Siam. 3. Nakon Si Thammarat, Siam. 4. Penang. 5. Perak. 6. Kuala Lipis, Pahang. 7. Kampong Nabo, N. Borneo. 8-11. Singapore. 12. Deli, Sumatra. 13-14. Sumatra. 15-17. Nias. 18-19. Great Natuna. 20-21. Sarawak. 22. Padas, N. Borneo. 23. Bongen, N. Borneo. 24. Philippines. 25-27. Java. 28. Macassar, Celebes.

1. Bangkok, Siam. 2. Paknam Kabin, Siam. 3. Nakon Si Tamarat, Siam. 4. Penang. 5. Perak. 6. Kuala Lipis, Pahang. 7. Kampong Nabok, Jalor. 8-11. Singapore. 12. Deli, Sumatra. 13-14. Sumatra. 15-17. Nias. 18-19. Great Natuna. 20-21. Sarawak. 22. Padas, N. Borneo. 23. Bawen, N. Borneo. 24. Philippines. 25-27. Java. 28. Macassar, Celebes.

British Museum has received under that name from the California Academy are young (24 and 28 millim. long from snout to vent) and are distinguished by a shorter web, not reaching the discs of the third and fifth toes and leaving three phalanges of the fourth free; they have a small outer metatarsal tubercle and the back of the thighs streaked with black and white. I find the two last characters combined in a young from Ok Yam, S.E. Siam, which, in the extent of the web between the toes, is intermediate between the typical *R. erythræa* and *R. taipehensis*. Similar young have been noticed by Annandale under the name of *R. tylleri*. I have also seen young specimens from Siam, typical in coloration, but with the web not more developed than in *R. taipehensis*. Werner (*Verh. Zool.-bot. Ges. Wien*, 1893, p. 357) records an adult specimen from Borneo with "Zehen mit Ausnahme der vierten mit $\frac{3}{4}$ Schwimmhäuten."

[This species, which is particularly common in rice-fields in the Malay Peninsula, usually sits on floating water-plants or in bushes at the edge of water, into which it leaps when disturbed. I have also seen it—if the Indian form is really synonymous with the Malay one—on stones forming the inner coating of a well in Orissa. N. A.]

78. *Rana macrodactyla*.

Hylarana macrodactyla, Günth. *Cat. Batr. Sal.* p. 72, pl. ii, fig. C. (1858).
and *Rept. Brit. Ind.* p. 424 (1861); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 104.

Rana trivittata, Hallow. *Proc. Ac. Philad.* 1860, p. 504.

? *Hylarana subcærulea*, Cope, *Proc. Ac. Philad.* 1868, p. 110.

Rana macrodactyla, Bouleng. *Cat. Batr. Ecaud.* p. 54 (1882); Boettg. *Ber. Offenb. Ver. Nat.* 1888, p. 96; Bouleng. *Faun. Ind., Rept.* p. 465 (1890); S. Flower, *Proc. Zool. Soc.* 1899, p. 895; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885; Bouleng. *Faun. Mal. Pen., Rept.* p. 238 (1912); Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1917, p. 265, pl.—, fig. 3.

Vomerine teeth in more or less oblique groups or short series between the choanæ, nearer to each other than to the latter or equally distant.

Head moderately depressed, much longer than broad; snout pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis obtuse; loreal region not very oblique, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or exceeds that of the upper eyelid; tympanum very distinct, $\frac{3}{8}$ to once the diameter of the eye, 2 to 4 times its distance from the latter.

Fore limb slender; fingers long and slender, the tips dilated into very small discs with a groove separating the upper from the lower surface; first and second fingers equal, third as long as or longer than the snout; subarticular tubercles moderately large, prominent.

Hind limb very long and slender; the tibio-tarsal articulation reaches the tip of the snout or a little beyond, the heels strongly overlap when the limbs are folded at right angles to the body;

tibia $4\frac{1}{2}$ to $5\frac{1}{2}$ times as long as broad, $1\frac{1}{3}$ to $1\frac{5}{16}$ times in length from snout to vent, as long as or a little shorter than the fore limb, as long as or shorter than the foot, which is nearly as long as the distance between tympanum and vent. Toes very long and slender, the tips dilated into very small discs similar to those of the fingers, $\frac{1}{2}$ webbed, 3 phalanges of fourth and 2 of third and fifth free; outer metatarsals cleft almost to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval, very small, about $\frac{1}{8}$ the length of the inner toe; a very small, more or less distinct, round outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the dorso-lateral folds $\frac{1}{2}$ to $\frac{1}{3}$ the length of head and body; another glandular fold often extending from behind the tympanum to the side of the body, continuous or interrupted, and a third from below the eye to a little beyond the angle of the mouth. Lower parts smooth, thighs granulate near the vent.

Colour, in life, above rich dark brown, spotted with black and, in some individuals, mottled with dull yellow and vivid green, with 4 or 5 very distinct longitudinal lines, which are white with golden shades; the median line (rarely absent) from the tip of the snout to the vent, the next on the dorso-lateral fold, the outer from the tympanum to the hind limb; upper surface of limbs reddish yellow with dark brown markings, forming short cross-bars on the thigh and the sides of the tibia and 2 or 3 longitudinal lines on the back of the thigh. Head and body white beneath, limbs yellowish. Iris golden.

Males without secondary sexual characters.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, which is largely exposed and truncate in front; zygomatic branch of squamosal rather long. Terminal phalanges feebly expanded at the end.

Ova measuring 1 millimetre in diameter.

The tadpole has been described by Malcolm Smith. Tail pointed, twice as long as the body. Beak narrowly edged with black; lips with the papilla short at the sides and long below; one long uninterrupted series of horny teeth above, two below, the outer short and uninterrupted, the inner long and narrowly interrupted.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
	♂	♀	♀	♀	♀	♀	♀	♂	♂	♀	♀	♂	♀	♀
From snout to vent	26	39	32	37	44	41	36	28	27	37	41	32	37	35
Head ..	10	14	12	13	15	14	13	11	11	13	15	12	13	13
Width of head ..	8	11	9	10	12	12	10	8	8	10	11	9	10	9
Snout ..	4	6	5	6	6	6	5	4.5	4.5	6	6	5	6	6
Eye ..	3	4	4	4	4	4	4	3.5	3.5	4	4	3.5	4	4
Interorbital width ..	2.5	3	3	3	3	3	3	2	2.5	3	3	2.5	2.5	2.5
Tympanum ..	3	4	3	3	4	4	3	3	3	3	3.5	2.5	3	3
Fore limb ..	15	23	20	22	25	26	22	17	17	22	25	20	22	21
First finger ..	3	5	4	4	5	5	4	3.5	3.5	4.5	5	4	5	5
Second finger ..	3	5	3.5	4	5	5	4	3.5	3.5	4.5	5	4	5	5
Third finger ..	5.5	7	6.5	7	8	8	7	6	5.5	6	8	6.5	7.5	7

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	
	♂	♀	♀	♀	♀	♀	♀	♂	♂	♀	♀	♂	♀	♀	
Fourth finger	..	3	5	4	4	5	4	3.5	3.5	4.5	5	4	5	5	
Hind limb	..	50	81	66	74	82	72	62	52	49	63	73	60	72	68
Tibia	15	24	20	23	25	22	19	17	15	20	23	19	22	20
Foot	18	27	22	25	27	25	20	17	16	20	24	20	24	23
Third toe	..	9	12	11	12	14	12	11	9	8	11	12	10	12	11
Fourth toe	..	15	23	19	21	24	21	18	14	14	18	20	17	20	19
Fifth toe	..	10	16	13	15	18	15	13	10	9	13	14	12	14	13

1. Hong Kong. 2-3. Hong Kong (types). 4. China (type). 5-7. Man Son Mts., Tonkin. 8. Bangkok. 9-10. Sapatoom, Siam. 11. Pera-kan, Camboja. 12-14. Kedah, Malay Peninsula.

Habitat. Southern China, Tonkin, Burma, Siam, Malay Peninsula.

79. *Rana aurantiaca*.

Rana aurantiaca, Bouleng. *Fourn. Bomb. N.H. Soc.* XV, 1904, p. 430, pl.—, fig. 1.

Vomerine teeth in short oblique series between the choanæ, nearer the latter than to each other.

Head much depressed, longer than broad; snout obtusely pointed, a little longer than the eye, scarcely projecting beyond the mouth; canthus rostralis distinct; loreal region nearly vertical, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which is a little greater than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ the diameter of the eye and 3 times its distance from the latter.

Fingers long and rather slender, the tips dilated into very small discs which are longer than broad and have the upper surface separated from the lower by a groove; first finger a little longer than the second, third a little longer than the snout; sub-articular tubercles moderate.

Hind limb rather long and slender, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 6 times as long as broad, $\frac{1}{2}$ the length of head and body, shorter than the fore limb, as long as the foot. Toes with the tips dilated like the fingers, $\frac{2}{3}$ webbed; outer metatarsals separated nearly to the base; subarticular tubercles rather small; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{1}{4}$ the length of the inner toe; a small, round outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold, from above the tympanum to the hip, its distance from its fellow, on the back, 6 times in the length from snout to vent.

Orange above, without spots on the back or bars on the limbs; a black band along each side of the head and body; upper lip, canthus rostralis, and dorso-lateral fold white; terminal discs of toes black; lower parts white.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, the upper part of which is uncovered and very obtusely pointed in front.

Male unknown.

Measurements of type.

From snout to vent	..	..	..	..	38 millim.
Head	..	..	..	..	14 "
Width of head	..	..	..	..	10 "
Snout	..	..	..	..	5 "
Eye	..	..	..	..	4 "
Interorbital width	..	..	..	..	3 "
Tympanum	..	..	..	..	3 "
Fore limb	..	..	..	..	25 "
Hind limb	..	..	..	..	61 "
Tibia	..	..	..	..	19 "
Foot	..	..	..	..	19 "

Habitat. Travancore. This species is known from a single specimen found near Trivandrum by Capt. H. S. Ferguson.

It is now preserved in the British Museum.

80. *Rana sanguinea.*

Rana sanguinea, Boettg. *Zool. Ans.* 1893, p. 364.

Vomerine teeth in oblique series between the choanæ and extending beyond the level of the posterior borders of the latter.

Head longer than broad; snout $1\frac{1}{2}$ times as long as the eye, rounded and obliquely truncate in front and projecting beyond the mouth; canthus rostralis strong; loreal region nearly vertical, concave; nostril much nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum very distinct, more than $\frac{3}{4}$ the size of the eye.

Fingers slender, with the tips dilated into very small discs, first longer than the second.

Hind limb very long, the tibio-tarsal articulation reaching far beyond the tip of the snout; tibia as long as the distance between the eye and the vent, longer than the fore limb, shorter than the foot. Toes with the tips dilated like the fingers, $\frac{3}{4}$ webbed, 2 phalanges of fourth free; subarticular tubercles very strong, conical; no tarsal fold; two subequal metatarsal tubercles, inner oval, outer round.

Skin smooth; a prominent but narrow glandular dorso-lateral fold from above the temple to the sacral region; an oval gland below the tympanum.

Uniform carmine red above, dark reddish grey on the sides; a black band on the loreal region and a black temporal spot; upper lip white; limbs with rather indistinct, very oblique dark cross-bands; hinder side of thighs yellow, marbled with black. Throat whitish, with dark spots near the jaw; a dark spot on each side of the breast; belly sulphur yellow; lower surface of hind limbs fleshy red.

From snout to vent 44 millim.; head 15.5; width of head 13; fore limb 29; hind limb 95; tibia 32; foot 41.5.

Habitat. Calamianes Ids., Philippines.

Known from a single female specimen preserved in the Senckenberg Museum.

81. *Rana temporalis*.

Hylarana malabarica (non Tschudi), Kelaart, *Prodr. Faun. Zeyl.* I, p. 191 (1852).

? *Rana flavescens*, Jerdon, *Journ. As. Soc. Beng.* XXII, 1854, p. 531.

Rana malabarica, part., Günth. *Cat. Batr. Sal.* p. 11 (1858).

Hylarana malabarica, part., Günth. *op. cit.* pp. 131, 142.

Hylorana temporalis, Günth. *Rept. Brit. Ind.* p. 427, pl. xxvi. fig. G (1864), and *Proc. Zool. Soc.* 1875, p. 569.

Hylorana flavescens, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83.

Rana temporalis, Boulenger, *Cat. Batr. Ecaud.* p. 63 (1882), and *Faun. Ind., Rept.* p. 459 (1890).

Vomerine teeth in short oblique series originating between the choanæ and extending beyond the level of their posterior borders, equally distinct from each other and from the latter or a little closer together.

Head as long as broad or a little longer than broad, much depressed; snout rounded or obtusely pointed, more or less projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis well marked; loreal region feebly oblique or nearly vertical, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{1}{4}$ to $\frac{3}{4}$ the diameter of the eye, $1\frac{1}{2}$ to 3 times as long as its distance from the latter.

Fingers long and slender, terminating in small discs which are longer than broad and bear a groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb long and rather slender, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{3}$ to $1\frac{2}{3}$ times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes ending in small discs, similar to those of the fingers; web extending to the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; sub-articular tubercles rather large and prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, about $\frac{1}{3}$ the length of the inner toe; a small, round outer tubercle.

Skin smooth or finely granulate above; a moderately broad and very prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, $4\frac{1}{2}$ to 5 times in length from snout to vent; a glandular fold from below the eye to the shoulder. Lower parts smooth.

Yellowish brown to dark brown above, usually without, exceptionally with, small darker spots; dorso-lateral fold usually with a dark outer edge; a dark brown or black streak below the canthus rostralis, continued on the temporal region, and sometimes on the side of the body; a more or less distinct light streak on the upper lip and below the temporal spot; limbs with dark

brown cross-bands. Lower parts white, uniform or spotted or mottled with brown on the throat and breast.

Males with internal vocal sacs, with the fore limb strong and a large flat gland on the inner side of the arm; a strong pad on the inner side of the first finger, covered during the breeding season with a greyish brown velvet-like horny layer.

Nasal bones narrow, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, truncate or rounded in front, not extending to between the nasals. Terminal phalanges with short transverse distal expansion.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
	♂	♂	♀	♀	♂	♂	♀	♀	♂	♂	♂	♀	♀	♀	♀	♂	♀
From snout to vent ..	57	51	77	75	57	55	74	70	56	55	54	77	65	64	57	60	81
Head ..	21	19	25	25	20	20	25	24	20	20	19	26	23	22	20	21	26
Width of head ..	21	19	25	25	20	20	25	23	20	20	19	26	23	22	18	20	26
Snout ..	8	7	9	10	8	7	10	9	8	8	7	10	9	9	8	8	11
Eye ..	8	6	9	9	7	7	8	8	8	8	7	9	8	8	7	8	9
Interorbital width ..	4.5	4	6	6	4	4	6	5	4.5	4.5	4	6	5	5	5	4.5	7
Tympanum ..	5	4	6	6	4.5	4	6	6	4.5	4.5	4	6	5	5	4.5	5	6
Pore limb ..	38	34	46	47	36	37	46	43	38	38	36	53	42	42	36	38	52
First finger ..	9	9	11	12	9	10	11	11	9	8	7.5	13	11	11	9	8	13
Second finger ..	7	8	10	10	7	8	10	9	7	7	6.5	12	9	9	8	7	11
Third finger ..	11	12	15	13	11	12	14	14	11	11	10	17	13	13	12	11	16
Fourth finger ..	7	6	8	9	7	8	9	8	7	6	11	9	8	8	7	7	10
Hind limb ..	95	90	128	122	93	97	126	120	100	96	94	142	118	114	97	101	136
Tibia ..	31	30	42	40	31	31	42	40	32	31	30	45	39	38	31	32	45
Foot ..	29	27	37	37	28	30	39	37	30	29	28	43	35	36	29	31	41
Third toe ..	15	16	21	21	16	17	20	19	15	16	16	23	19	18	15	16	22
Fourth toe ..	23	22	31	30	22	25	31	31	24	23	23	27	29	29	24	26	37
Fifth toe ..	16	16	21	23	17	17	23	23	17	17	16	26	21	20	17	19	25

1-4. Ceylon (types). 5-7. Punduloya, Ceylon. 8. Piermerd, Travancore. 9-15. Bolumputty Anamalis. 16-17. Malabar.

Habitat. Malabar and Ceylon.

This frog should perhaps be regarded as a variety of the African *R. albilabris*, Hallow.

[This species is found chiefly at the edge of rocky streams at no great altitude. It sits exposed on flat rocks and stones and leaps, often for a considerable distance, into the water when disturbed. N. A.]

82. *Rana florensis*.

Rana florensis, Bouleng. Ann. and Mag. N.H. (6) XIX, 1897, p. 508.

Vomerine teeth in short oblique groups between the choanæ, nearer to the latter than to each other.

Head as long as broad or a little longer than broad, much depressed; snout truncate and projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width or the width of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{2}{3}$ the diameter of the eye and 3 to 5 times its distance from the latter.

Fingers long and slender, terminating in small discs, which are a little longer than broad, measuring $\frac{2}{3}$ to $\frac{1}{2}$ the diameter of the tympanum, and bear a horseshoe-shaped groove separating the upper from the lower surface; first finger longer than the second, third much longer than the snout; subarticular tubercles large and very prominent.

Hind limb long and rather slender; tibio-tarsal articulation reaching the tip of the snout, heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to $5\frac{1}{2}$ times as long as broad, about $1\frac{3}{4}$ times in length from snout to vent, shorter than the fore limb, a little longer than the foot. Toes ending in well-developed discs, similar to those of the fingers; web reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles large and prominent; no tarsal fold; inner metatarsal tubercle oval, about $\frac{1}{3}$ the length of the inner toe; a round outer tubercle.

Skin smooth above, or rough with small granular asperities; a narrow glandular dorso-lateral fold from above the tympanum to the hip, stronger in front; the distance between the dorso-lateral folds, on the back, 5 to 6 times in length of head and body; a glandular fold from below the eye to the shoulder. Lower parts smooth.

Grey or olive above, sides of head darker; tympanum brown; dorso-lateral fold not darker; limbs with dark cross-bands. Lower parts much spotted or marbled with dark brown, the throat and breast nearly entirely of a dark brown.

Males with internal vocal sacs; fore limb very strong, with a flat gland on the inner side of the arm.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals.

Eggs 2 millim. in diameter.

Measurements of types, in millimetres.

	♂	♂	♂	♀
From snout to vent	66	64	61	78
Head	22	22	21	26
Width of head	19	20	18	26
Snout	8	8	8	9
Eye	8	8	7	9
Interorbital width	5	5	4.5	7
Tympanum	5	6	5	6
Fore limb	46	43	44	50
First finger	9	9	10	12
Second finger	8	8	8	10
Third finger	14	14	14	18
Fourth finger	9	10	10	12
Hind limb.. .. .	112	110	110	132
Tibia	37	37	35	45
Foot	35	34	34	43
Third toe	18	18	17	21
Fourth toe.. .. .	27	26	28	36
Fifth toe	21	20	20	25

Habitat. Flores, above 3,000 feet.

Distinguished from *R. temporalis* by the smaller groups of vomerine teeth, which do not extend posteriorly beyond the choanæ, and by the larger discs.

83. *Rana nicobariensis*.

- Hylorana nicobariensis*, Stoliczka, *Journ. As. Soc. Beng.* XXXIX, 1870, p. 150, pl. ix, fig. 2.
Rana macularia, var. *javanica*, Horst, *Notes Leyd. Mus.* V, 1883, p. 243.
Rana nicobariensis, Bouleng. *Ann. and Mag. N.H.* (5) XVI, 1885, p. 389, *Faun. Ind., Rept.* p. 459 (1890), *Ann. and Mag. N.H.* (6) VIII, 1891, p. 391; Vincig. *Ann. Mus. Genova* (2) XII, 1892, p. 525; van Kampen, *Zool. Jahrb., Syst.* XXII, 1905, p. 704; Bouleng. *Faun. Mal. Pen., Rept.* p. 240 (1912); Annand. *Mem. As. Soc. Beng.* VI, 1917, pp. 140, 142.
Rana erythræa, var. *elongata*, Werner, *Fahresb. Nat. Ver. Magdeb.* 1892, p. 253.
Rana lemniscata, Boettz. *Zool. Anz.* 1893, p. 337.
Rana tytléri, part., Isenschmid, *Mitth. Nat. Ges. Bern.* 1903, p. 9.
Rana javanica, van Kampen, in M. Web. *Zool. Ergebn. Reise Nied. O.-Ind.* IV, p. 392 (1907) and *Nat. Tijdschr. Ned. Ind.* LXIX, 1909, p. 36; Annand. *Journ. Fed. Mal. St. Mus.* VII, 1917, p. 108.

Vomerine teeth in oblique groups or short series between the choanæ, or extending a little beyond the level of their posterior borders, equally distant from each other or a little nearer the latter.

Head longer than broad, much depressed; snout more or less pointed, more or less projecting beyond the mouth, longer than the eye; canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct, $\frac{3}{8}$ to $\frac{1}{2}$ the diameter of the eye, 3 to 5 times its distance from the latter.

Fingers long and slender, with a feeble dermal border, terminating in rather small discs which are as long as broad, $\frac{1}{4}$ to $\frac{3}{8}$ the diameter of tympanum, with the upper surface separated from the lower by a horseshoe-shaped groove; first finger longer than the second, third longer than the snout; subarticular tubercles moderately large, very prominent.

Hind limb rather long and slender, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to $5\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to 2 times in length from snout to vent, a little shorter than the fore limb, as long as or a little longer than the foot. Toes ending in rather small discs, same as those of the fingers, $\frac{1}{2}$ to $\frac{3}{4}$ webbed, 2 or 3 phalanges of fourth free; the web rarely reaching the discs of the third and fifth toes; outer metatarsals separated nearly to the base; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval, $\frac{1}{4}$ to $\frac{1}{2}$ the length of the inner toe; a round outer tubercle.

Skin smooth or finely granulate above, with or without small warts; a strong, narrow or moderately broad glandular dorso-

lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 5 to 6 times in the length of head and body. Lower parts smooth, posterior part of thighs granulate.

Greyish or reddish brown above, uniform or spotted with darker¹; sides of head dark brown or black, which shade may be prolonged on the sides of the body below the lateral folds; a white streak on the upper lip; limbs with dark cross-bands. White beneath, uniform or spotted with brown, throat and breast brown in the males.

Males with internal vocal sacs; fore limb strong, with a flat oval gland on the inner side of the arm and a moderately strong pad on the inner side of the first finger.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals.

Tadpoles from Tenasserim, received under the name of *R. nicobariensis* from the Indian Museum, have the tail obtusely pointed and $1\frac{1}{2}$ to $1\frac{3}{4}$ times as long as the body, and bear black dots and light-edged black ocellar spots; the beak is narrowly edged with black and there are 6 or 7 upper and as many lower series of labial teeth, the 2 or 3 outer upper and all but the inner lower uninterrupted.

Eggs measure $1\frac{1}{2}$ millim. in diameter in a female 42 millim. long from snout to vent.

Habitat. Nicobars, Tenasserim, Malay Peninsula, Sumatra and neighbouring islands, Borneo, Mentavei, and Java.

The web between the toes varies in extent, sometimes reaching the discs of the third and fifth, sometimes not extending beyond the basal phalanx; but these two extremes are connected by every degree.

Rana nicobariensis and *R. varians*, Blgr., are two closely allied species, which may be distinguished as follows:—

R. nicobariensis.—Nostril considerably nearer the tip of the snout than the eye; tibio-tarsal articulation reaching the nostril or the tip of the snout; toes $\frac{1}{2}$ to $\frac{3}{4}$ webbed, 2 phalanges of third and fifth free; male with a flat gland on the inner side of the arm.

R. varians.—Nostril equally distant from the eye and the tip of the snout, or a little nearer the latter; tibio-tarsal articulation reaching beyond the tip of the snout; web reaching the discs of the third and fifth toes; male without humeral gland.

In 1891 (*Ann. and Mag. N.H.* VIII, p. 291) I identified *R. macularia*, var. *javanica*, Horst, with *R. nicobariensis*, but both van Kampen (in M. Weber, *Zool. Ergebn. Reis. Nied. O.-Ind.* IV, p. 392) and Annandale (*Journ. Fed. Mal. St. Mus.* VII, 1917, p. 108) have demurred to this identification and regard the Java frog as a distinct species, *R. javanica*, which is stated to differ in the nostril being only a little nearer the tip of the snout than the eye, in the broader interorbital region ($1\frac{1}{2}$ times the width of the upper

¹ Annandale mentions a specimen from Java with a faint light vertebral line.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
From snout to vent	♂	♂	♂	♂	♀	♀	♀	♀	♀	♂	♂	♂	♀	♀	♂	♀	♀	♂	♀	♀	♀
Head	38	38	38	36	39	35	54	39	54	44	43	42	55	53	38	42	50	34	36	36	30
Width of head	15	15	14	14	14	13	19	14	19	16	16	16	19	19	13	15	18	12	13	13	11
Snout	12	12	12	11	11	10	15	11	15	14	14	13	16	16	11	12	14	10	10	10	9
Eye	6	5.5	5	5	6	5	8	6	8	6	6	6	6	7	5.5	6	8	5	5	6	5
Interorbital width	5	5	4	4	4.5	4	6	4.5	6	5	5	5	6	6	4.5	5	5	4	4	4	3.5
Tympanum	3	3	3	3	3	2.5	4	3	4	3	3	3.5	4.5	4	3	3	3.5	3	2.5	2.5	2.5
Fore limb	4	3.5	3.5	3.5	3	3	4	3.5	4	4	4	4	4.5	4.5	3	3.5	4	3	2.5	3	2.5
First finger	24	23	25	23	25	22	36	24	33	27	27	27	36	35	25	27	33	20	23	23	19
Second finger	6	5.5	5.5	5.5	5.5	5	9	6	8	5.5	6	5.5	7	7	6	6	7	5	5	5	4.5
Third finger	5	5	5	5	5	4.5	8	5	7	5	5	5	6	6	5.5	5	6	4.5	4	4.5	4
Fourth finger	7	7	7	7	8	6.5	11	7	11	7	8	8	10	10	7	8	10	7	7	7	6
Hind limb	4	4.5	5	4.5	5	4.5	7	5	7	5	5	5	6	6	5	5	6	4.5	4	4.5	3.5
Tibia	64	62	65	60	67	60	100	65	88	72	72	70	95	91	68	72	91	54	68	65	53
Foot	21	20	21	20	22	20	33	21	29	23	23	23	31	30	21	23	30	17	21	21	17
Third toe	20	19	20	19	21	18	29	20	27	22	22	22	27	28	21	22	23	17	20	20	16
Fourth toe	11	10	11	10	11	10	16	11	15	11	11	11	15	15	11	12	15	10	11	10	9
Fifth toe	16	15	17	15	17	15	26	17	23	18	18	18	22	24	17	17	24	15	17	16	14
	12	11	12	11	12	11	17	12	17	12	12	12	17	18	12	13	18	10	12	11	10

1-2. Nicobars. 3-4. Burma. 5. Kuala Tahan, Pahang. 6. Kuala Lumpur, Selangor. 7-8. Deli, Sumatra. 9. Nias. 10-14. Engano. 15-16. Bongon, N. Borneo. 17. Seraini, Mentawai. 18-19. Pengalengan, Java. 20-21. Salak, Java.

eyelid), and in the shorter web between the toes, reaching only the end of the basal phalanx of the third and fifth toes.

An examination of 5 specimens from Java proves this distinction to break down.

[It is curious that all the specimens of this frog found in the Malay Peninsula have been captured in or close to the large limestone caves characteristic of many districts of that country. In the Jalor caves I have seen individuals well inside the mouth of the Goah Glap. N. A.]

84. *Rana varians*.

Rana varians, Bouleng. *Ann. and Mag. N.H.* (6) XIV, 1894, p. 86, and *Proc. Zool. Soc.* 1897, p. 231; Boettg. *Abh. Senck. Ges.* XXV, 1901, p. 366, pl. xv, fig. 8.

Rana moluccana, Boettg. *Zool. Ans.* 1895, p. 132; Barbour, *Mem. Mus. Comp. Zool.* XLIV, 1912, p. 66, fig., pl. v, fig. 12.

Vomerine teeth in strong oblique series between the choanæ or extending beyond the level of their posterior borders, equally distant from each other and from the latter.

Head longer than broad, much depressed; snout rounded or more or less pointed, projecting beyond the mouth, usually longer than the eye; canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril equidistant from the eye and from the tip of the snout, or a little nearer the latter; distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{5}{8}$ the diameter of the eye, $1\frac{1}{2}$ to 4 times its distance from the latter.

Fingers long and slender, terminating in small discs which are a little longer than broad, with the upper surface separated from the lower by a horseshoe-shaped groove; first finger longer than the second, third as long as or longer than the snout; sub-articular tubercles large and very prominent.

Hind limb very long and slender, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to 6 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, longer than the foot. Toes ending in small discs, same as those of the fingers; web reaching the discs of the third and fifth, usually 2 phalanges of fourth free; subarticular tubercles large and prominent; outer metatarsals separated nearly to the base; no tarsal fold; inner metatarsal tubercle oval, $\frac{1}{4}$ to $\frac{1}{3}$ the length of the inner toe; a small, round outer tubercle.

Skin smooth or very granulate above, with or without small warts; a narrow but very prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 5 to $6\frac{1}{2}$ times in the length of head and body. Lower parts smooth, posterior part of thighs granulate.

Brown, pink, or grey above; a dark brown or black streak below the canthus rostralis and a temporal blotch; a whitish streak along the upper lip; some specimens with a pale vertebral line and another along the upper surface of the tibia; limbs with dark cross-bands; hinder side of thighs brown or marbled with brown. Lower parts white, throat and breast sometimes dark brown; often a blackish spot on each side of the breast.

Males with internal vocal sacs; fore limb very strong, with a moderately strong pad on the inner side of the first finger, covered, during the breeding season, with a yellowish horny layer.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals.

Eggs measuring $1\frac{1}{2}$ millim. in female 62 millim. long.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
	♂	♂	♀	♀	♀	♀	♀	♂	♀	♀	♀	♀	♀
From snout to vent ..	42	42	73	72	68	66	66	46	56	69	64	62	55
Head ..	16	16	25	23	25	23	23	17	21	23	23	21	20
Width of head ..	14	13	22	22	23	21	21	15	17	20	20	18	15
Snout ..	7	7	11	9	11	10	10	6	8	10	10	9	8
Eye ..	6	6	8	8	8	8	8	6	7	7	7	7	6.5
Interorbital width ..	2.5	2.5	4	4	4	4	4	3	4	4	4	4	3.5
Tympanum ..	5	5	6	5	6	5	5	4.5	4.5	6	5	5	5
Fore limb ..	25	28	46	45	45	44	43	30	40	48	44	42	35
First finger ..	5.5	6	11	11	11	11	10	8	10	14	12	11	10
Second finger ..	5	5.5	9	9	9	9	8	6	8	11	9	8	7
Third finger ..	7	8	13	13	13	13	12	9	11	15	13	12	11
Fourth finger ..	5	5	8	9	8	8	8	7	8	11	10	8	7
Hind limb ..	76	84	137	130	133	124	122	81	115	128	122	119	96
Tibia ..	26	28	48	44	45	41	42	26	35	43	40	37	31
Foot ..	21	25	37	36	36	34	34	24	32	36	35	32	29
Third toe ..	12	13	20	19	20	20	19	14	16	20	19	18	16
Fourth toe ..	18	20	33	31	31	30	29	21	26	32	30	27	25
Fifth toe ..	12	14	24	23	24	22	21	15	19	23	21	20	17

1-7. Palawan (types). 8-9. Masarang, Celebes. 10-13. Batjan.

Habitat. First described from Palawan, this species has since been found in Luzon, in Celebes, and in Batjan, Halmaheira, and Ternate.

Our material shows the characters on which Barbour based his distinction of *R. moluccana* from *R. varians* to be merely individual, not geographical. Some specimens from Palawan answer his definition of *R. moluccana* (shorter web, smaller tympanum).

85. *Rana alticola*.

Hylorana tytleri (non Theob.), Stoliczka, *Journ. As. Soc. Beng.* XXXIX, 1870, p. 148, pl. ix, fig. 1.

Hylorana pipiens, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83.

Rana alticola, Bouleng. *Cat. Batr. Ecaud.* p. 32, fig. (1882); Annand. *Rec.*

Ind. Mus. VIII, 1912, p. 22, pl. iv, fig. 1; Malcolm Smith, *Journ.*

N.H. Soc. Siam, II, 1916, p. 167; Annand. *Mem. As. Soc. Beng.* VI,

1917, pp. 140, 144.

Rana tytleri, part., Bouleng. *Faun. Ind., Rept.* p. 458 (1890); Annand.

Mem. As. Soc. Beng. VI, 1917, p. 141.

Rana nigrovittata, part., W. Sclater, *Proc. Zool. Soc.* 1892, p. 345.

Rana alticola, part., Annand. *Rec. Ind. Mus.* VIII, 1912, p. 8.

Rana leptoglossa (non Cope), Annand. *Mem. As. Soc. Beng.* VI, 1917, p. 140, fig.

Vomerine teeth in short oblique series between the choanæ or extending a little beyond the level of their posterior borders, equally distant from each other and from the latter.

Head longer than broad, much depressed; snout a little longer than the eye, more or less obtusely pointed, moderately or feebly projecting beyond the mouth; canthus rostralis strong; loreal region feebly oblique, concave; nostril nearer the end of the snout than the eye; distance between the nostrils equal to or a little less than the interorbital region, which equals or exceeds that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to nearly once the diameter of the eye, 2 to 5 times as long as its distance from the latter.

Fore limb slender; fingers long and slender, with small discs which are longer than broad and bear a groove separating the upper from the lower surface; first finger a little longer than the second, third longer than the snout; subarticular tubercles large, very prominent.

Hind limb long and slender; tibio-tarsal articulation reaching the tip of the snout or beyond; heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to 6 times as long as broad, $1\frac{3}{4}$ to $1\frac{1}{2}$ times in length from snout to vent, as long as or a little shorter than the fore limb, considerably longer than the foot. Toes slender, with discs same as those of the fingers but a little broader, webbed to the discs of the third and fifth, two phalanges (rarely one only) of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles large and prominent; no tarsal fold; inner metatarsal tubercle oval, about $\frac{1}{4}$ the length of the inner toe; a more or less distinct outer tubercle.

Skin smooth; a feebly prominent, narrow glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 6 to $6\frac{1}{2}$ times in length from snout to vent; another, sometimes indistinct, from behind the tympanum to the shoulder.

Light brown above, scarcely or not spotted, sides dark brown¹; a light vertebral streak may be present above the coccyx; dorso-lateral fold whitish, black-edged on the outer side; upper lip whitish with a dark margin; limbs with or without narrow dark cross-bands. Lower parts white, the throat brown or with crowded brown spots, usually with a light median line.

Males with internal vocal sacs; no other secondary sexual characters.

¹ The light bar ascending from the upper lip between the eye and the tympanum, regarded by Annandale as a specific character of *R. leptoglossa*, is present in one of the specimens from Klong Beng Lai.

Nasal bones narrow, oblique, widely separated from each other; ethmoid exposed above, obtusely pointed in front, not extending to the nasals.

Tadpole remarkable for the presence of a parotoid-like porous flat oval gland on each side of the body and sometimes a third near the base of the tail. Tail pointed, $1\frac{1}{2}$ to 2 times as long as head. Mouth moderately large; beak broadly edged with black; 7 or 8 upper and as many lower series of horny labial teeth, the outer upper marginal and uninterrupted, the second upper also uninterrupted, the others paired; the lower series all uninterrupted or the innermost narrowly interrupted. A blackish, light-edged ocellar spot on each side of the muscular part of the tail, near its base.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	♂	♀	♀	♀	♀	♂	♂	♂	♀	♀	♂	♀
From snout to vent	..	39	50	49	48	39	38	37	50	63	53	58
Head	15	18	17	18	17	15	14	14	18	23	19
Width of head	13	15	15	15	14	12	11	11	15	20	16
Snout	6	7	6.5	8	6.5	5.5	5	5	7	9	7
Eye	5	6	6	6	5.5	5	4.5	4.5	6	7	6
Interorbital width	..	4	4.5	4	4	4	3.5	3.5	3	4	5	4
Tympanum	4	4.5	3.5	4	3.5	4	4	3.5	4	5	4.5
Fore limb	26	34	34	34	32	27	25	25	33	39	35
First finger	5.5	6	6.5	7	6.5	5.5	5	5	6.5	8	6
Second finger	5	5.5	6	6	6	5	4	4.5	5.5	7	5.5
Third finger	9	10	11	10	10	9	7	8	10	12	9
Fourth finger	5	6	6.5	7	6	5	4	4.5	5.5	7	5.5
Hind limb	66	90	89	89	80	71	63	62	82	115	92
Tibia	22	31	31	30	27	24	21	21	28	40	31
Foot	19	23	23	24	22	20	17	17	22	35	26
Third toe	9	11	12	12	11	10	8	8	11	20	13
Fourth toe	15	19	19	20	18	16	14	14	18	29	22
Fifth toe	11	13	13	14	13	11	8	8	11	22	15

1-3. Shillong, Assam (types). 4-5. Cheera Punjee, Khasi hills. 6. Khasi hills. 7-9. Klong Beng Lai, Siam. 10. Man Son Mts., Tonkin. 11-12. Pegu (Ind. Mus.).

Habitat. Hills of Assam, Siam and Tonkin (near the Kwangsi frontier), Pegu. A recently transformed young, labelled as from Moulmein, is preserved in the British Museum and appears to be referable to the species described and figured by Stoliczka as *Hylorana tyleri*.

I believe the specimens referred by Annandale to *R. leptoglossa*, Cope, belong to this species. According to Annandale's short description they differ from Cope's type by the longer hind limb (tibio-tarsal articulation reaching end of snout or beyond instead of to front of orbit) and the dorso-lateral fold is represented as narrow (instead of 'heavy'). No mention is made by Cope of the interruption in the dark band extending from the tip of the snout to behind the tympanum; his description is "Above olivaceous, with a blackish band from end of muzzle to groin, margined with yellow below, from below eye to axilla."

Dr. Annandale has been so kind as to send me three specimens from Pegu, from Stoliczka's collection, representing his *Rana*

leptoglossa. Measurements of two of them are given above, columns 11 and 12. The only difference I can detect between them and the more northern specimens on which *R. alticola* is founded is the presence of a light vertical bar between the eye and the tympanum, to which Dr. Annandale has drawn attention.

[This frog, to judge from the prevalence of the tadpoles in spring, is common round Shillong, but the adult conceals itself at this season even in rainy weather and I have never succeeded in finding a specimen. In March and April the tadpoles, which are gregarious, are to be seen in every pool with a muddy bottom in the larger streams in the neighbourhood of the station. They are diurnal in habits and largely carnivorous. In the evening they conceal themselves, but as soon as the sun is well up they may be seen to emerge from under the banks and to feed on insect larvae in the mud. Though very conspicuous in lateral view, from above they appear entirely dark, of a deep olivaceous shade, and the large ocellus on the tail is only visible in lateral view. In life it is deep orange yellow and black. The parotoid glands pour out a profuse milky secretion when the tadpole is irritated.

The tadpole with more than one ocellus on the tail is, I now believe, distinct. In large numbers examined at Shillong none were found with more than one ocellus, whereas in larval specimens of this type from Burma at least two such markings are always present on the tail. Perhaps these Burmese tadpoles are those of *R. nicobariensis*. There must surely have been some confusion about those specimens in the Indian Museum labelled as being from the Pamirs. *N. A.*]

86. *Rana celebensis*.

Rana celebensis, Peters, *Mon. Berl. Ac.* 1872, p. 585; van Kampen, in M. Weber, *Zool. Ergebn. Reis. Nied. O.-Ind.* IV, p. 395 (1907).

Vomerine teeth in short series extending a little beyond the level of the posterior borders of the choanæ.

Head longer than broad; snout rounded, projecting beyond the mouth, as long as the orbit; canthus rostralis strong; loreal region nearly vertical, concave; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum very distinct, nearly as large as the eye.

Fingers with small but very distinct discs, first longer than the second; subarticular tubercles well developed.

The tibio-tarsal articulation reaches the nostril; tibia more than $\frac{1}{2}$ length of head and body, shorter than the fore limb.

Toes with discs similar to those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free; no tarsal fold; inner metatarsal tubercle oval, outer round and not much smaller.

Skin of upper parts finely granulate, with or without large warts on the back; a broad glandular dorso-lateral fold, as in *R. erythræa*. Lower parts smooth.

Brown above; loreal and temporal regions, dorsal warts and dorso-lateral folds darker; a white streak along the upper lip; limbs with dark cross-bands.

From snout to vent 46 millim.

Habitat. Celebes.

According to van Kampen, who has examined the type specimen, this species is very near *R. varians*, and he thinks it possible that both may have to be united. The shorter hind limb and the broad dorso-lateral fold are, I think, characters sufficient to maintain the separation.

Van Kampen also thinks that the specimen, of unknown origin, which I have described in the Catalogue Batr. Ecaud., p. 70 (1882) and in the Proc. Zool. Soc. 1897, p. 232, must belong to a different species. Of this I am not convinced, as the specimen agrees in most particulars with the above description, the differences not exceeding those distinguishing individuals in various species of this group of *Rana*. These differences are:—Vomerine teeth not extending posteriorly beyond the choanæ (equally distant from each other and from the latter); first finger not longer than the second; several large, prominent oval glands on the sides below the dorso-lateral fold. The tibia is $3\frac{1}{2}$ times as long as broad.

Measurements.

From snout to vent	..	..	..	45 millim.
Head ..	..	..	..	17
Width of head ..	..	..	..	16
Snout ..	..	..	..	6
Eye ..	..	..	..	6
Interorbital width ..	..	..	..	3
Tympanum ..	..	..	..	4.5
Fore limb ..	..	..	..	27
First finger ..	..	..	..	5
Second finger ..	..	..	..	5
Third finger ..	..	..	..	7
Fourth finger ..	..	..	..	4
Hind limb ..	..	..	..	74
Tibia ..	..	..	..	25
Foot ..	..	..	..	22
Third toe ..	..	..	..	12
Fourth toe ..	..	..	..	19
Fifth toe ..	..	..	..	14

The specimen is a male, with internal vocal sacs, strong fore limbs, and an oval flat gland on the inner side of the arm.

87. *Rana garoensis*, sp. n.

Vomerine teeth in short oblique series between the choanæ.

Head longer than broad, much depressed; snout pointed, strongly projecting beyond the mouth, as long as the eye; canthus rostralis strong; loreal region not very oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the interorbital width, which equals that of the upper eyelid; tympanum very distinct,

$\frac{1}{2}$ the diameter of the eye, $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers rather slender, the tips dilated into very small discs with a groove separating the upper from the lower surface; first and second fingers equal, third a little longer than the snout; sub-articular tubercles moderately large, prominent.

Hind limb long, the tibio-tarsal articulation reaching a little beyond the tip of the snout, the heels strongly overlapping; tibia $4\frac{1}{2}$ to 5 times as long as broad, $1\frac{3}{4}$ times in length from snout to vent, as long as the fore limb, longer than the foot. Toes with the tips more strongly dilated than those of the fingers, entirely webbed; outer metatarsals separated nearly to the base; sub-articular tubercles small but very prominent; no tarsal fold; inner metatarsal tubercle oval, $\frac{1}{2}$ the length of the inner toe; a round outer tubercle.

Skin granulate above; a feebly prominent, narrow, interrupted glandular dorso-lateral fold, from above the tympanum to the hip; lower parts smooth.

Greyish brown above, blackish brown on the sides, the latter shade sharply defined above by the canthus rostralis and the dorso-lateral fold; a white streak along the upper lip; limbs with dark cross bars. Lower parts white.

Male unknown.

Measurements.

From snout to vent	..	..	..	38 millim.
Head ..	..	..	..	14
Width of head ..	..	..	..	12
Snout ..	..	..	..	5
Eye ..	..	..	..	5
Interorbital width ..	..	..	..	3
Tympanum ..	..	..	..	2.5
Fore limb ..	..	..	..	23
First finger ..	..	..	..	5
Second finger ..	..	..	..	5
Third finger ..	..	..	..	7
Fourth finger ..	..	..	..	5
Hind limb ..	..	..	..	67
Tibia ..	..	..	..	23
Foot ..	..	..	..	20
Third toe ..	..	..	..	11
Fourth toe ..	..	..	..	17
Fifth toe ..	..	..	..	12

This species is founded on two specimens which Dr. Annandale had referred to a new species under the above name, and which he has generously passed on to me for description. They were obtained by Mr. and Mrs. Kemp in the Garo hills, Assam, above Tura, at an altitude of 3,500 to 3,900 feet. The specimens were captured leaping about in long grass.

88. *Rana nasica*.

Rana nasica, Bouleng. *Ann. and Mag. N.H.* (7) XII, 1903, p. 187.

Vomerine teeth in short or moderately long oblique series between the choanæ.

Head longer than broad, much depressed; snout pointed, very prominent, as long as the eye, which is large; canthus rostralis sharp; loreal region not very oblique, deeply concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the interorbital width, which nearly equals that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ or slightly more than $\frac{1}{2}$ the diameter of the eye, $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers rather slender, the tips dilated into well-developed discs with a groove separating the upper from the lower surface; first finger longer than the second, third a little longer than the snout; subarticular tubercles moderately large, prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{3}{8}$ to $1\frac{1}{2}$ times in length from snout to vent, a little shorter than the fore limb, a little longer than the foot. Toes with the tips dilated like the fingers, entirely webbed; outer metatarsals separated nearly to the base; sub-articular tubercles small but very prominent; no tarsal fold; inner metatarsal tubercle oval, $\frac{1}{4}$ to $\frac{1}{3}$ the length of the inner toe; a small, round outer tubercle.

Skin smooth, with granular tubercles on the pelvic region; a feebly prominent, narrow glandular dorso-lateral fold from above the tympanum to the sacral region.

Greyish olive or brown above, with or without blackish spots; canthus rostralis, temple, and outer edge of glandular fold blackish; upper lip, from below the nostril, white; tympanum reddish; limbs with numerous regular dark cross-bands. Lower parts white, uniform or dotted with brown.

Males with a large external vocal sac on each side of the throat.

Nasal bones small, oblique, separated from each other and from the frontoparietals; ethmoid largely exposed above, pointed in front and extending to between the nasals.

Measurements of types, in millimetres.

		♂	♂	♂	♂
From snout to vent	..	46	45	42	41
Head ..	..	15	16	16	15
Width of head ..	..	13	13	13	12
Snout ..	..	6	6	6	5.5
Eye ..	..	6	6	6	5.5
Interorbital width ..	..	2.5	2.5	3	3
Tympanum ..	..	3	3	3	3
Fore limb ..	..	29	27	28	26
First finger ..	..	6	5	5.5	5
Second finger ..	..	5	4	5	4.5
Third finger ..	..	7	7	7	6
Fourth finger ..	..	5	4	5	4
Hind limb ..	..	80	75	80	71
Tibia ..	..	26	25	26	24
Foot ..	..	24	23	24	21
Third toe ..	..	13	13	13	11
Fourth toe ..	..	21	20	21	17
Fifth toe ..	..	14	14	14	13

Habitat. Man-Son Mountains, Tonkin, 3,000-4,000 ft. Closely allied to *R. alticola*, which differs in the less prominent snout and the less deeply concave loreal region.

89. *Rana arfaki*.

Rana arfaki, A. B. Meyer, *Mon. Berl. Ac.* 1874, p. 138; van Kampen, *Nova Guinea*, V, *Zool.* p. 165 (1906), and IX, *Zool.* p. 36 (1909); Bouleng. *Ann. and Mag. N.H.* (9) I, 1918, p. 239.

Limnodytes arfaki, part., Petets et Doria, *Ann. Mus. Genova*, XIII, 1878, p. 418.

Rana macroscelis, Bouleng. *Ann. and Mag. N.H.* (6) I, 1888, p. 345; *Ann. Mus. Genova*, (2) XVIII, 1898, p. 706; Roux, *Abh. Senck. Ges.* XXXIII, 1910, p. 226; Bouleng., *Tr. Zool. Soc.* XX, 1914, p. 249.

Rana waigeensis, van Kampen, *Bijdr. Dierk.* XIX, 1913, p. 90, and *Nova Guinea*, IX, *Zool.* p. 459, pl. xi, fig. 2 (1913).

Vomerine teeth in straight or feebly curved, more or less oblique series between the choanæ or extending a little beyond the level of the posterior borders of the latter, usually nearer each other than the choanæ.

Head much depressed, as long as broad or broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis distinct; loreal region oblique, deeply concave; nostril equidistant from the eye and from the tip of the snout or a little nearer the latter; distance between the nostrils equal to or greater than the interorbital region, which is usually slightly concave and measures $\frac{2}{3}$ to $\frac{3}{4}$, or rarely nearly equals, the width of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ or $\frac{3}{4}$ the diameter of the eye, once to twice its distance from the latter.

Fingers rather long, the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface, first much longer than the second, third longer than the snout, second and third with more or less distinct dermal margin; subarticular tubercles large and prominent.

Hind limb long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the tip of the snout or slightly beyond; the heels feebly overlapping; tibia 3 to 4 times as long as broad, $1\frac{1}{2}$ to a little more than 2 times in length of head and body, shorter than the fore limb, as long as or longer than the foot. Toes with the tips dilated into small discs similar to those of the fingers, webbed to the discs; outer metatarsals separated nearly to the base; subarticular tubercles rather large, prominent; no tarsal fold; inner metatarsal tubercle elliptic, moderately prominent, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; outer tubercle absent or flat and rather indistinct.

Upper parts smooth or shagreened, with or without small flat warts, or granulate with large elongate warts with small horny spinules; a glandular fold above the temple. Lower parts smooth, posterior half of thigh granulate.

Olive or brown above, uniform or with darker and lighter spots, or reddish brown with scattered small yellow spots; tympanum

num often reddish; limbs without or with very indistinct dark cross-bands. Whitish beneath, throat and breast usually spotted or marbled with dark brown.

Males with an external vocal sac on each side of the throat and a large oval gland on the inner side of the arm; a moderately strong pad on the inner side of the first finger, covered, during the breeding season, with a velvety greyish horny layer.

Nasal bones small, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to the anterior borders of the nasals; zygomatic process of squamosal longer than the posterior.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
	♂	♀	♀	♀	♀	♀	♂	♂	♀	♀	♂	♀	♀
Head ..	76	162	142	140	120	148	103	103	147	140	84	123	152
Width of head ..	28	52	49	47	40	50	36	36	49	50	30	42	53
Snout ..	11	20	19	17	17	17	14	13	18	18	12	16	20
Eye ..	11	20	18	16	15	17	14	13	18	18	11	15	20
Interorbital width ..	5	11	13	11	10	10	6	7	12	11	7	8	12
Tympanum ..	5	10	10	10	7	9	8	7	9	8	5	7	10
Fore limb ..	47	95	86	84	72	95	62	64	90	89	54	77	91
First finger ..	12	24	22	22	20	25	15	16	21	21	15	22	25
Second finger ..	10	20	19	19	18	20	12	13	19	19	12	18	19
Third finger ..	13	28	26	25	23	28	18	18	27	27	17	24	27
Fourth finger ..	9	19	19	18	17	19	13	14	19	19	12	18	20
Hind limb ..	122	250	235	220	205	250	177	175	248	240	140	217	267
Tibia ..	41	83	75	73	66	83	54	55	81	80	44	70	85
Foot ..	41	79	71	68	64	78	54	53	78	73	45	70	80
Third toe ..	22	44	37	35	34	41	27	28	40	39	25	39	49
Fourth toe ..	35	67	56	54	53	65	45	43	63	60	37	60	68
Fifth toe ..	25	53	42	42	41	49	33	33	49	46	28	44	55

1-2. Mimika R., Dutch New Guinea. 3-5. Soghere, Brit. New Guinea (types of *R. macrocelis*). 6. Soghere District. 7-10. Haveri, Brit. New Guinea. 11. Albert Edward Range, B.N.G. 12. Madew, B.N.G. 13. Astrolabe Mts., B.N.G.

Habitat. New Guinea, Waigeou and Aru Islands.

In this and the 10 following species, I regard the absence of the dorso-lateral glandular fold as secondary, these species being, in my opinion, derived from the *Ranae typicae* group of the subgenus *Rana*.

90. *Rana andersonii*.

Polypedates yunnanensis, Anders. *Anat. Zool. Res. Yunn.* p. 846, pl. lxxviii, fig. 3 (1879).

Rana andersonii, Bouleng. *Cat. Batr. Ecaud.* p. 55 (1882), *Faun. Ind., Rept.* p. 447 (1890), and *Proc. Zool. Soc.* 1899, pp. 168 and 960.

Vomerine teeth in transverse or slightly oblique series between the choanæ or extending a little beyond the level of the posterior borders of the latter.

Head as long as broad or slightly broader than long, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as the eye or a little shorter; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril equidistant from the eye and from the tip of the snout or a little nearer the former; the distance between the nostrils equals or a

little exceeds the interorbital width, or that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{1}{2}$ the diameter of the eye and $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers rather long, terminating in small discs, which are longer than broad and divided by a groove into an upper and a lower portion; first finger as long as or a little longer than the second, third much longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb long; tibio-tarsal articulation reaching the tip of the snout or a little beyond; heels overlapping when the limbs are folded at right angles to the body; tibia 4 to 5 times as long as broad, $1\frac{2}{3}$ to $1\frac{1}{3}$ times in length from snout to vent, as long as or a little shorter than the fore limb, slightly or a little longer than the foot. Toes ending in small discs, same as those of the fingers, webbed to the discs; subarticular tubercles rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle rather small, feebly prominent, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Back finely areolate or granulate, sides often with large flat warts; males with minute white spinose tubercles on the sides. Lower parts smooth.

Olive above, with large roundish brown spots, the ground colour sometimes forming a mere network between them; sides with black spots; limbs with numerous dark cross-bands; hinder side of thighs yellow, spotted or marbled with black. Lower parts white, throat sometimes marbled with brown.

Males with internal vocal sacs; fore limb much thickened, the inner finger with a large pad, covered, during the breeding season, with a velvety grey horny layer.

Nasals small and widely separated from each other and from the frontoparietals; upper part of ethmoid largely uncovered anteriorly.

Measurements, in millimetres.

	1.	2.	3.	4.	5.
	♂	♂	♀	♀	♀
From snout to vent ..	53	66	82	82	95
Head ..	18	23	29	28	30
Width of head ..	18	22	30	29	32
Snout ..	6	7	10	10	11
Eye ..	7	8	10	10	11
Interorbital width ..	4.5	5	7	6	7
Tympanum ..	3.5	4	4	5	5
Fore limb ..	35	47	61	51	57
First finger ..	7	9	14	11	12
Second finger ..	6.5	9	14	10	11.5
Third finger ..	10	12	16	15	17
Fourth finger ..	6	8	12	11	12
Hind limb ..	100	121	156	155	168
Tibia ..	32	38	51	51	55
Foot ..	31	37	50	48	48
Third toe ..	16	21	26	25	27
Fourth toe ..	24	30	41	38	40
Fifth toe ..	18	23	30	39	30

1. Hotha Valley, Yunnan (type). 2-3. Kakhien hills, Upper Burma. 4. Kuatun, N.-W. Fokien. 5. Foochow.

Habitat. Upper Burma, Yunnan, Fokien, Hainan.

This species appears to be related to *R. grahami* in exactly the same degree as *R. adenopleura* to *R. pleuraden*, thus pointing to a polyphyletic origin for the subgenus *Hylorana*.

The fact that a glandular dorso-lateral fold is sometimes present in *R. grahami* justifies my belief that its absence in *R. andersonii*, as well as in other species which I group with it, is secondary.

91. *Rana schmackeri*.

Rana schmackeri, Boettg. *Katal. Batr. Samml. Senck. Ges.* p. 11 (1892).

Vomerine teeth in strong, very oblique series originating between the anterior corners of the choanæ and extending considerably beyond the level of their posterior borders.

Snout hardly longer than the orbit, somewhat pointed; canthus rostralis obtuse; loreal region oblique, somewhat concave; nostril a little nearer the end of the snout than the eye; interorbital region a little narrower than the upper eyelid; tympanum very distinct, $\frac{3}{4}$ the size of the eye.

First finger a little longer than the second; tips of fingers dilated into small discs.

Tibio-tarsal articulation reaching the tip of the snout; tibia $1\frac{1}{3}$ times in length of head and body; toes entirely webbed; tarsal fold feebly indicated; a very feeble and indistinct inner metatarsal tubercle; no outer tubercle.

Skin smooth or finely corrugated; a feeble glandular fold above the tympanum; a glandular fold from below the eye to the shoulder; posterior part of belly feebly granulate.

Bluish green-grey above, with black marblings and larger rounded dark spots, which may be somewhat light-edged; sides with sharply defined round black spots; limbs with numerous dark cross-bars; sides of head with black spots, the glandular fold below the tympanum greenish white. Lower parts dirty white, limbs orange.

From snout to vent 42 millim.

Habitat. Ichang, C. China.

This species was described from a single specimen in the Senckenberg Museum. It appears to be allied to *R. andersonii*, from which it differs in the vomerine dentition and in the larger tympanum.

92. *Rana ijimæ*.

Buergeria ijimæ, Stejneger. *Proc. Biol. Soc. Washingt.* XIV, 1901, p. 190.

Rana ijimæ, Stejneger. *Herp. Japan.* p. 121, fig. (1907); T. Vogt, *Sitzb. Ges. Nat. Fr. Berl.* 1913, p. 179.

Vomerine teeth in slightly oblique series on a line with the posterior borders of the choanæ.

Snout rounded, somewhat projecting; canthus rostralis rather abruptly bent; loreal region concave; nostril much nearer the tip of the snout than the eye; interorbital space slightly narrower

than the upper eyelid; tympanum very distinct, $\frac{1}{2}$ the diameter of the eye.

First finger extending slightly beyond the second; tips of fingers dilated into small discs, that of the third less than half the diameter of the tympanum.

The tibio-tarsal articulation reaches considerably beyond the tip of the snout; heels strongly overlapping; tibia $1\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb; toes about $\frac{3}{4}$ webbed, 2 phalanges of fourth free; discs slightly smaller than those of the fingers; subarticular tubercles very prominent; no tarsal fold; inner metatarsal tubercle oval, not prominent, about $\frac{1}{2}$ the length of the inner toe; a small outer metatarsal tubercle.

Skin of upper parts obscurely shagreened, with a few scattered pustules on the back and many on the sides; three large glandular warts behind the corner of the mouth; from the posterior corner of the eye a somewhat indistinct dorso-lateral fold, which on the shoulder seems broken up into a series of shorter longitudinal glands; sides of head and upper surface of tibia with numerous small white asperities. Lower parts smooth.

Dark chocolate brown above, apparently nearly uniform, dorso-lateral folds and upper surface of limbs paler; a whitish line under the eye and on the posterior part of the upper lip, which is mottled with brown along the edge; flanks pale brownish, with irregular blackish spots; limbs with dark brown cross-bars; hinder side of thighs mottled with dark brown. Lower parts whitish, with very faint brown mottlings on the throat, on the chest, and on the hind limbs.

From snout to vent 68 millim.

Habitat. Okinawa Shima, Loo Choo Islands; Formosa.

The above description is derived from Stejneger's, based on a single specimen preserved in the Science Collection at Tokyo.

Formosa has been added to the habitat by T. Vogt.

93. *Rana signata*.

Polypedates signatus, Günth. *Proc. Zool. Soc.* 1872, p. 600, pl. xl, fig. c.

Polypedates similis, Günth. *Proc. Zool. Soc.* 1873, p. 171.

Rana signata, Bouleng. *Cat. Batr. Fcaud.* p. 71 (1882), and *Ann. and Mag. N.H.* (6) VII, 1891, p. 342; Werner, *Zool. Jahrb., Syst.* XIII, 1900, p. 493; Laidlaw, *Proc. Zool. Soc.* 1900, p. 886; Bouleng. *Faun. Mal. Pen., Rept.* p. 237 (1913).

Rana similis, Bouleng. *Cat.* p. 72.

Rana obsoleta, Mocquard, *Le Natur.* 1890, p. 155, *N. Arch. Mus. Paris* (3) II, 1890, p. 147, and *Mém. Soc. Zool. France*, V, 1892, p. 198.

Vomerine teeth in small oblique groups close together, on a level with the posterior borders of the choanæ or just behind them.

Head a little longer than broad, much depressed; snout rounded or subacuminate, feebly projecting beyond the mouth, a little shorter than the eye, which is very large and prominent; canthus rostralis distinct; loreal region very feebly oblique, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the inter-

orbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{1}{2}$ the diameter of the eye, close to the eye or not less than 3 times as long as its distance from it.

Fingers slender, the tips dilated into very small discs, which bear a groove separating the upper from the lower surface; first finger a little longer than the second, third longer than the snout; subarticular tubercles moderately large, very prominent.

Tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia 4 to $5\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to a little less than 2 times in length from snout to vent, shorter than the fore limb, a little longer than the foot. Toes slender, the tips with very small discs similar to those of the fingers, about $\frac{3}{4}$ webbed, the web reaching or not quite reaching the discs of the third and fifth. two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small but very prominent, no tarsal fold; inner metatarsal tubercle oval or elliptic, $\frac{1}{3}$ to $\frac{2}{5}$ the length of the inner toe; a round outer tubercle.

Upper parts smooth or with large flat granules; glandular dorso-lateral fold absent or flat and very indistinct, or represented by a chain of large warts; lower parts smooth.

Dark olive or blackish above, with yellowish spots, or olive largely spotted or marbled with black; a yellow or white streak from the tip of the snout along the canthus rostralis and the border of the upper eyelid, continued along each side of the back; sometimes a white line on the upper lip; hind limbs with black and light cross-bars, or orange spotted or barred with black. Brownish white or brown beneath, uniform or spotted with white.

Males with internal vocal sacs, strong fore limbs, with a more or less distinct oval gland on the inner side of the arm, and a small pad on the inner side of the first finger, covered, during the breeding season, with a yellowish velvety horny layer.

Eggs $1\frac{1}{2}$ millim. in diameter in female 50 millim. from snout to vent, strongly pigmented in the upper third.

Nasal bones moderately large, separated from each other and in contact with the ethmoid, which is largely uncovered above and truncate in front.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.
	♂	♂	♂	♂	♂	♀	♀	♂	♀
From snout to vent	..	..	..	..	..	..	..	..	..
Head ..	40	40	40	39	36	58	50	35	38
Width of head ..	15	15	15	15	14	21	18	14	14
Snout ..	5	5	5	5	4	6	6	4	4
Eye ..	6	6	6	6	5	7	7	5	5
Interorbital width ..	3	3	3	3	3	4	4	3	3
Tympanum ..	3.5	4	4	3.5	3	5	5	3.5	3.5
Fore limb ..	28	28	28	26	25	40	35	25	26
First finger ..	6	6	6	6	5.5	9	7	5.5	6
Second finger ..	5.5	5.5	5.5	5.5	5	8	6	5	5

			1.	2.	3.	4.	5.	6.	7.	8.	9.
			♂	♂	♂	♂	♂	♀	♀	♂	♀
Third finger	8	8	8	8	7	12	9	7
Fourth finger	6	5	6	6	5	7	6	5
Hind limb	69	65	68	66	61	91	83	62
Tibia	22	21	22	22	20	30	26	20
Foot	21	20	21	21	19	28	24	19
Third toe	12	11	12	12	11	15	13	11
Fourth toe	17	16	17	17	15	23	19	16
Fifth toe	12	11	12	12	11	16	13	11

1. Matang, Borneo (type). 2-7. Lanas, Brunei, Borneo. 8. Akar R., Sarawak.
9. Laguna del Bay, Luzon (type of *R. similis*).

Habitat. Malay Peninsula (between Kedah and Perak), Sumatra, Borneo, Luzon.

94. *Rana picturata*, sp. n.

Vomerine teeth in oblique groups or short series between the choanæ, close together or equally distant from each other and from the latter.

Head as long as broad, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little less than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{1}{2}$ the diameter of the eye, 3 to 4 times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 to $5\frac{1}{2}$ times as long as broad, a little more than half the length from snout to vent, much shorter than the fore limb, as long as or slightly longer than the foot. Toes with the tips dilated into small discs similar to those of the fingers, about $\frac{3}{4}$ webbed, the web reaching or nearly reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, moderately prominent, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the inner toe; a round outer tubercle.

Upper parts more or less granulate, lower smooth.

Black above with numerous large yellow or pale brown round or irregular spots or marblings, the round spots sometimes with black centres; a yellow streak round the upper surface of the snout and the borders of the upper eyelids, sometimes continued on each side of the back; upper lip with small yellowish spots;

limbs with more or less irregular black and yellow or pale brown cross-bands. Lower parts brown, spotted with white, or brownish white with or without brown marblings.

Males with internal vocal sacs and an oval gland on the inner side of the arm.

Eggs $1\frac{1}{2}$ millim. in diameter in female 68 millim. long from snout to vent.

Nasal bones narrow, oblique, separated from each other; ethmoid exposed above, truncate in front, not extending to between the nasals.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
	♂	♀	♀	♂	♂	♂	♂	♂	♂	♂
From snout to vent	.. 46	70	68	59	44	43	43	44	40	37
Head	.. 16	23	22	20	15	15	15	15	14	12
Width of head	.. 16	23	22	20	15	15	15	15	14	12
Snout	.. 5	7	7	7	5	5	5	5	4	4
Eye	.. 6	8	8	8	6	6	6	6	5.5	5
Interorbital width	.. 3	4	5	5	3	3	3	3.5	3	3
Tympanum	.. 4	5	6	5	3.5	3.5	4	4	3.5	3
Fore limb	.. 33	47	48	42	31	30	29	33	27	26
First finger	.. 8	12	12	10	7	7	7	7	6	5.5
Second finger	.. 7	10	10	9	6	6	6	6	5.5	5
Third finger	.. 10	13	14	11	9	9	9	9	8	7
Fourth finger	.. 7	9	10	9	6	6	6	6	5	5
Hind limb	.. 77	108	116	98	73	71	70	(?)	65	63
Tibia	.. 25	34	37	30	23	23	22	24	21	20
Foot	.. 24	34	35	30	23	22	22	24	20	20
Third toe	.. 13	19	19	16	11	11	11	12	10	10
Fourth toe	.. 20	29	30	27	19	18	18	20	17	17
Fifth toe	.. 14	20	21	18	12	12	12	14	11	11

1-4. Bidi Caves, Sarawak. 5-7. Sarawak. 8. Kina Balu. 9-10. Barabas, S.-E. Borneo.

-Habitat. Borneo.

Intermediate between *R. signata* and *R. glandulosa*.

95. *Rana moellendorffi*.

Rana moellendorffi, Boettg. *Zool. Ans.* 1893, p. 363.

Vomerine teeth in small round groups on a level with the posterior borders of the choanæ; nearer to each other than to the latter.

Head as long as broad; snout obtuse, as long as the eye; canthus rostralis blunt; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye; eye large, very prominent; interorbital region nearly twice as broad as the upper eyelid; tympanum very distinct, $\frac{1}{3}$ to $\frac{1}{2}$ the size of the eye.

Fingers slender, the tips dilated into very small discs, which are longer than broad and provided with a lateral groove; first finger longer than the second; subarticular tubercles strong.

Tibio-tarsal articulation reaching the tip of the snout; tibia $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, shorter than the fore limb. Toes moderately long, the tips dilated like the fingers,

$\frac{3}{4}$ webbed; subarticular tubercles strong; a rather strong, elongate inner and a small round outer metatarsal tubercle.

Upper parts finely corrugated, with small warts on the posterior part of the upper eyelids and on the lumbar region; belly smooth.

Light bronzy or greyish green above, with numerous sharply defined black spots, the black predominating over the ground colour; lower parts dark brown or blackish, with numerous whitish spots.

Male unknown.

From snout to vent 49 millim.; hind limb 80.

Habitat. Culion Id., Calamianes, Philippines.

Types preserved in the Senckenberg Museum.

Appears to be closely allied to *R. signata*.

96. *Rana glandulosa*.

Rana glandulosa, Bouleng. *Cat. Batr. Ecaud.* p. 73, pl vii, (1882), *Ann. and Mag. N.H.* (6) VIII, 1891, p. 291, and XIV, 1894, p. 87; S. Flower, *Proc. Zool. Soc.* 1896, p. 905; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 200; Bouleng. *Faun. Mal. Pen., Rept.* p. 236 (1913); Annand. *Mem. As. Soc. Beng.* VI, 1917, p. 146.

Vomerine teeth in short oblique series between the choanae or on a level with their posterior borders, equally distant from each other or nearer to the latter.

Head as long as broad or a little broader than long, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis obtuse; loreal region oblique, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little narrower than that of the upper eyelid; tympanum very distinct, $\frac{3}{8}$ to $\frac{1}{2}$ the diameter of the eye, 2 to 3 times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface; first finger much longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 to 4 $\frac{1}{2}$ times as long as broad, 1 $\frac{5}{8}$ to 2 $\frac{1}{8}$ times in length from snout to vent, much shorter than the fore limb, as long as or a little longer or a little shorter than the foot. Toes with the tips dilated into small discs similar to those of the fingers, $\frac{1}{2}$ to $\frac{3}{4}$ webbed; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, moderately prominent, $\frac{1}{3}$ to $\frac{1}{2}$ the length of the inner toe; a round outer tubercle.

Skin of upper parts smooth or granulate, with large flat glandules, at least on the sides; a chain of glands sometimes representing the dorso-lateral fold; lower parts smooth.

Olive-brown or reddish brown above, often spotted and speckled with blackish; lips dark, with large whitish spots or bars; limbs with dark cross-bars more or less distinct. Lower parts whitish or buff, uniform or spotted with brown.

Males with an external vocal sac forming folds on each side of the throat, and a large oval gland on the inner side of the arm.

Nasal bones narrow, oblique, separated from each other; ethmoid exposed above, truncate in front, not extending to between the nasals.

Eggs 2 millim. in diameter in female measuring 66 millim. from snout to vent, unpigmented.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
	♂	♀	♀	♀	♂	♀	♀	♀	♀	♀	♀
From snout to vent ..	92	72	66	60	80	59	82	83	60	48	50
Head ..	30	25	24	19	27	20	27	28	20	16	17
Width of head ..	36	25	24	19	27	20	29	28	20	16	17
Snout ..	12	9	8	8	10	8	10	11	8	6	6
Eye ..	12	9	8	7	10	8	10	10	8	6	6
Interorbital width ..	8	5	5	4	5	5	6	6	5	3	4
Tympanum ..	7	6	6	4.5	6	5	7	7	5	4	4
Fore limb..	62	48	43	41	51	39	50	54	43	30	32
First finger ..	17	14	11	11	13	11	13	13	12	9	8
Second finger ..	13	10	7	7	10	7	10	10	8	6	6
Third finger ..	18	15	12	11	14	11	14	14	12	9	9
Fourth finger ..	12	9	7	7	10	7	9	10	8	6	6
Hind limb ..	139	111	103	97	118	99	113	127	102	73	78
Tibia ..	43	34	34	31	36	32	35	38	32	24	25
Foot ..	44	34	31	28	36	31	36	38	31	24	25
Third toe ..	23	18	15	14	18	15	18	19	15	12	13
Fourth toe ..	36	29	25	24	31	25	30	32	25	19	21
Fifth toe ..	24	19	16	14	18	15	19	20	15	12	13

1. Kuala Lipis, Pahang. 2. Malacca. 3-4. Singapore. 5. Sarawak (type). 6. Sarawak. 7. Mt. Mubu, Sarawak. 8-9. Spitang, Sarawak. 10. Mt. Batu Song, Sarawak. 11. Bongon, N. Borneo.

Habitat. Northern Shan States (Burma), Malay Peninsula, Sumatra, Borneo, Palawan.

97. *Rana baramica*.

Rana baramica, Boettg. *Abh. Senck Ges.* XXV, 1901, p. 391; van Kampen, in M. Web. *Zool. Ergebn. Reis. Nied. O.-Ind.* IV, 1907, p. 399.

This species appears, from the description, to be closely related to *R. glandulosa*, from which it differs principally in the head being a little longer than broad and the toes only $\frac{1}{2}$ webbed.

Axial length 55 millim.; hind limb 90; tibia 28.

The types are from the Baram River, North Borneo, and the species has been recorded from Banka by van Kampen.

98. *Rana luctuosa*.

Limnodytes luctuosus, Peters, *Mon. Berl. Ac.* 1871, p. 579, and *Ann. Mus. Genova*, III, 1872, p. 43, pl. vi, fig. 1.

Rana luctuosa, Bouleng. *Cat. Batr. Ecaud.* p. 68 (1882) and *Ann. and Mag. N.H.* (3) II, 1890, p. 341; S. Flower, *Proc. Zool. Soc.* 1896, p. 904, pl. xlvii, and 1899, p. 896; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 199; Bouleng. *Faun. Mal. Pen., Rept.* p. 238 (1912)

Rana decorata, Mocquard, *Le Natur.* 1890, p. 155, and *N. Arch. Mus.* (3) II, 1890, p. 145, pl. x, fig. 1.

Vomerine teeth in small oblique groups or short series between the choanæ, equally distant from each other and from the latter, or nearer together.

Head as long as broad, much depressed; snout rounded, as long as or a little shorter than the eye, feebly projecting beyond the mouth; canthus rostralis indistinct; loreal region scarcely oblique, feebly concave, nostril equally distant from the eye and from the tip of the snout; distance between the nostrils equal to or a little greater than the interorbital region, which is a little broader than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye, 2 to 3 times as long as its distance from the latter.

Fingers moderately long, the tips dilated into very small discs with a groove separating the upper from the lower surface; first finger longer than the second, third a little longer than the snout; subarticular tubercles moderate, prominent.

Hind limb rather long, tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, twice or a little less than twice in length from snout to vent, shorter than the fore limb, as long as or slightly longer or shorter than the foot. Toes with discs similar to but a little larger than those of the fingers, $\frac{1}{2}$ webbed; outer metatarsals bound together in the basal third; subarticular tubercles moderate, prominent; no tarsal fold; inner metatarsal tubercle elliptic, 2 to $2\frac{1}{2}$ times in the length of the inner toe; a very small outer tubercle.

Skin perfectly smooth.

Top of head and back bright red or rich dark chocolate-brown, bordered all round by a sharply defined white or yellow line; sides of head and body very dark brown or black; tympanum dark reddish brown; along the lower part of the side of the body a few white or yellow spots in an irregular line from the angle of the mouth to the thigh; limbs very dark brown or bluish black with bluish white or very pale grey or orange marblings or transverse lines. Throat brown or black, remainder of the lower parts dirty buff, darker on the limbs, sometimes with small light spots.

Males without secondary sexual characters.

Nasal bones very narrow, widely separated from each other by the ethmoid, which is broadly truncate in front and nearly reaches the premaxillaries.

Tadpole with the tail acutely pointed, nearly twice as long as the body. Beak broadly edged with black; upper lip with 5 or 6 series of horny teeth, only the outer uninterrupted; lower lip with 4 series of horny teeth, the innermost narrowly interrupted, the remainder uninterrupted.

Measurements, in millimetres.

	1. ♂	2. ♂	3. ♂	4. ♂	5. ♀	6. ♀	7. ♀	8. ♀	9. ♂	10. ♀	11. ♀	12. ♀	13. ♀	14. ♀	15. ♀
From snout to vent	45	43	41	41	49	48	47	43	42	48	44	53	42	42	60
Head ..	15	15	14	14	16	16	16	15	15	16	15	18	15	15	21
Width of head ..	15	15	14	14	16	16	16	15	15	16	15	18	15	15	21
Snout ..	6	5	5	5	5	6	6	5	5	6	5	5	5	5	7
Eye ..	6	6	5	5	5	6	6	5	5	6	5	5	5	5	7
Interorbital width	4	4	4	4	4	4	4	4	4	4	4	4	3	4	5
Tympanum ..	4	3	3	3	3	4	4	3	3	4	4	5	3	3	5
Fore limb ..	28	25	24	25	29	28	28	25	25	30	26	33	25	25	38
First finger ..	6	6	5	5	7	6	6	6	6	8	6	8	6	6	10
Second finger ..	5	5	5	5	6	5	5	5	5	7	5	6	5	5	8
Third finger ..	7	7	6	6	8	8	7	7	7	8	7	8	6	6	10
Fourth finger ..	4	4	4	4	5	5	5	4	4	6	5	6	4	4	7
Hind limb ..	74	68	66	68	80	78	77	68	71	80	72	83	70	70	?
Tibia ..	23	21	21	21	25	24	25	21	23	25	23	26	22	22	31
Foot ..	23	21	21	21	25	24	25	21	22	25	24	26	22	22	31
Third toe ..	11	11	11	11	13	12	13	11	12	14	12	14	11	12	16
Fourth toe ..	18	16	16	16	19	18	19	17	17	20	18	20	16	17	25
Fifth toe ..	11	11	11	11	12	12	13	11	12	13	11	12	11	11	16

1-8. Penang hill. 9-11. Larut hills, Perak. 12. Akar R., Sarawak. 13-14. Matang, Sarawak. 15. Sapa, Kina Balu, N. Borneo.

Habitat. Penang hill, between 2,000 and 2,200 feet; Larut hills, Perak, 4,000 feet, Borneo.

99. *Rana debussyi*.

Rana debussyi, van Kampen, *Nat. Tijdschr. Nederl. Ind.* LXIX, 1910, pp. 23, 40, pl. i, fig. 3.

Vomerine teeth in short oblique series between the choanæ.

Head considerably longer than broad; snout rounded, projecting beyond the mouth, $1\frac{1}{2}$ times as long as the eye; canthus rostralis rather sharp; loreal region feebly oblique; nostril nearly equally distant from the eye and from the end of the snout; interorbital space broader than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ the size of the eye.

Fingers with small but distinct discs, first longer than the second; subarticular tubercles well developed.

Tibio-tarsal articulation reaching the tip of the snout; tibia 5 times as long as broad, more than $\frac{1}{2}$ length from snout to vent. Toes with discs small but a little larger than those of the fingers, webbed only at the base, the web not reaching the basal subarticular tubercles; no tarsal fold; inner metatarsal tubercle small, elongate, outer smaller still, round.

Skin very finely granulate above.

Brown above, black on the side, the two shades separated by a white streak as in *R. luctuosa*; another white streak along the

upper lip and the side of the body to the groin ; limbs pale brown with dark cross-bars. Yellowish white beneath.

From snout to vent 50 millim.

Habitat. Sumatra.

This species is described as allied to *R. luctuosa*, but having much in common with *R. javanica (nicobariensis)*.

The single specimen is from Deli.

100. *Rana grisea*.

Rana grisea, van Kampen, *Nova Guinea*, IX, *Zool.* p. 460, pl. xi, fig. 3 (1913) ; Bouleng. *Tr. Zool. Soc.* XX, 1914, p. 250. and *Ann. and Mag. N.H.* (9) I, 1918, p. 239.

? *Rana novæ-britanniæ*, part., Werner, *Verh. Zool.-bot. Ges. Wien*, L.I, 1901, p. 614.

Vomerine teeth in oblique groups or short series between the choanæ or extending a little beyond the level of their posterior borders, a little nearer to each other than to the latter.

Head as long as broad or a little longer than broad, much depressed ; snout rounded, projecting beyond the mouth, as long as the eye or a little longer ; canthus rostralis strong ; loreal region not very oblique, deeply concave ; nostril a little nearer the tip of the snout than the eye ; distance between the nostrils greater than the interorbital width, which equals $\frac{2}{3}$ that of the upper eyelid ; tympanum very distinct, $\frac{1}{3}$ to $\frac{2}{3}$ the diameter of the eye and $1\frac{1}{2}$ to 3 times its distance from the latter.

Fingers long and slender, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the upper from the lower surface ; first finger longer than the second, third much longer than the snout ; subarticular tubercles large and very prominent.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{3}$ to $1\frac{1}{4}$ times in length from snout to vent, slightly shorter or slightly longer than the fore limb, longer than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, entirely webbed or two phalanges of fourth free ; outer metatarsals separated nearly to the base ; subarticular tubercles moderately large, prominent ; no tarsal fold ; inner metatarsal tubercle elliptic, $\frac{1}{3}$ the length of the inner toe ; a round outer tubercle.

Skin of upper parts smooth or finely granulate, with a few scattered small warts and white spinulose tubercles, which are very crowded on the dorso-lateral folds ; a rather narrow glandular dorso-lateral fold from above the tympanum to the hip or not quite so far ; the distance between these folds, on the back, 5 times in the length of head and body ; a glandular fold from below the eye to the shoulder. Lower parts smooth.

Brown above, uniform or with small darker spots, loreal and temporal regions darker ; tympanum reddish brown ; limbs with

oblique or angular dark cross-bands; hinder side of thighs dark purplish brown. Lower parts brown, more or less spotted or marbled with brown.

Males with a large external vocal sac on each side of the throat; fore limb strong, with a flat gland on the inner side of the arm; a large pad on the inner side of the first finger, covered, during the breeding season, with a greyish, velvety horny layer.

Measurements, in millimetres, of specimens from Utakwa River.

	♂	♂	♂
From snout to vent	76	74	68
Head	27	26	24
Width of head	27	26	22
Snout	11	10	9
Eye	9	10	8
Interorbital width	5	4	4
Tympanum	6	6	5
Fore limb	48	49	40
First finger	12	11	10
Second finger.. ..	10	9	9
Third finger	15	14	14
Fourth finger.. ..	10	9	10
Hind limb	133	135	125
Tibia	46	46	42
Foot	41	40	38
Third toe	22	21	20
Fourth toe	34	34	30
Fifth toe	24	24	22

Habitat. Dutch New Guinea. The type is from the Went Mts. about 4,200 ft.; the specimens in the Brit. Mus. are from the Utakwa R., 2,500-3,000 ft.

Distinguished from *R. florensis* by the more oblique loreal region, the rather longer hind limbs, and the presence of external vocal sacs in the male; from *R. krefftii* by the longer hind limbs.

101. *Rana krefftii*.

Hylorana erythraea, part., Günth. *Cat. Batr. Sal.* p. 73 (1858).

Rana krefftii, Bouleng. *Cat. Batr. Ecaud.* p. 64, pl. iii, fig. 2 (1882), *Tr. Zool. Soc.* XII, 1886, p. 52, and *Ann. and Mag. N.H.* (9) I, 1918, p. 240.

Rana novae-britanniae, Werner, *Zool. Anz.* XVII, 1894, p. 155, and *Mitt. Zool. Mus. Berl.* I, 1900, p. 111, fig.

Vomerine teeth in oblique groups or short series between the choanæ, equally distant from each other and from the latter.

Head a little longer than broad, much depressed; snout obtusely pointed, projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis strong; loreal region not very oblique, deeply concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, about $\frac{2}{3}$ the diameter of the eye and $2\frac{1}{2}$ to 4 times its distance from the latter.

Fingers long and slender, with narrow dermal border, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the

upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, 2 or a little more than 2 times in length from snout to vent, much shorter than the fore limb, as long as or slightly longer than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, the web reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; a round outer tubercle.

Skin of upper parts smooth; a moderately broad or rather broad glandular dorso-lateral fold from above the tympanum to the hip, the distance between these folds, on the back, 5 to $5\frac{1}{2}$ times in the length of head and body; a glandular fold from below the eye to the shoulder, followed by a small glandule. Lower parts smooth.

Uniform olive or chestnut-brown on the upper surface of the head and body, dark brown to blackish on the sides, the latter shade sharply defined above and below; a white streak extending along the upper lip; no spots; limbs with dark cross-bands; hinder side of thighs yellow, marbled with dark brown or black. White beneath, uniform or spotted or marbled with blackish brown.

Males with an external vocal sac on each side of the throat; a large flat gland on the anterior side of the arm; a moderately strong pad on the inner side of the first finger.

Osteological characters as in *R. papua*.

Measurements, in millimetres.

	1. ♂	2. ♀	3. ♀	4. ♀	5. ♀	6. ♀	7. ♀
From snout to vent	.. 59	64	73	57	54	50	49
Head ..	.. 21	22	27	21	21	18	18
Width of head ..	.. 20	21	25	19	19	17	17
Snout ..	.. 8	9	11	8	8	6	6
Eye ..	.. 7.5	8	9	7	8	6	6
Interorbital width	.. 3.5	4	4.5	4	3.5	3	3
Tympanum ..	.. 4.5	5	6	5	5	4	4
Fore limb ..	.. 39	43	48	36	35	31	33
First finger ..	.. 10	10	12	9	7	7	7
Second finger ..	.. 8.5	8.5	10	8	6	6	6
Third finger ..	.. 12	13	15	12	9	10	10
Fourth finger ..	.. 8	8.5	11	7	7	6	6
Hind limb ..	.. 94	104	116	92	78	75	74
Tibia ..	.. 29	32	37	29	25	23	23
Foot ..	.. 28	32	37	28	24	23	23
Third toe ..	.. 15	17	19	15	13	13	13
Fourth toe ..	.. 24	28	32	25	20	20	20
Fifth toe ..	.. 16	18	22	17	14	14	14

1. Solomon Ids. (type). 2. San Christoval (type). 3. Santa Anna. 4. Isabel.
5-7. Guadalcanar.

Habitat. Solomon Islands.—Werner's original description of *R. nova-britannica*, from New Britain, applies well to this species, except for the size of the tympanum, stated to be nearly as large as the eye. My suggestion as to the New Britain frog being referable to *R. krefftii* has been confirmed by Roux, *Rev. Suisse Zool.* XXVI, 1918, p. 411.

102. *Rana papua*.

- Rana papua*, Lesson, *Voy. Coquille*, Zool. II, i, p. 59, pl. vii, fig. 1 (1830).
 Boettg. in Semon, *Zool. Forsch.* p. 111 (1894); Mähely, *Term. Füzet. Budapest*, XX, 1897, p. 410; Werner, *Mitt. Zool. Mus. Berl.* I, 1900, p. 18; van Kampen, *Nova Guinea*, V. Zool. p. 164 (1906), and IX, *Zool.* p. 37 (1909), and p. 459 (1913). Bouleng. *Tr. Zool. Soc.* XX, 1914, p. 250, and *Ann. and Mag. N.H.* (9) I, 1918, p. 240.
Limnodytes waigiensis, Dum. et Bibr. *Exp. Gén.* VIII, p. 514 (1841).
Limnodytes papuensis, A. B. Mey. *Mon. Berl. Ac.* 1874, p. 52; Doria, *Ann. Mus. Genov.*, VI, 1874, p. 356.
Limnodytes papua, Peters et Doria, *Ann. Mus. Genova*, XIII, 1878, p. 418.
Limnodytes arfaki, part., Peters et Doria, *L. c.*, pl. vi, fig. 1.
Rana papua, part., Bouleng., *Cat. Batr. Ecaud.* p. 64 (1882), Roux, *Abh. Senck. Ges.* XXXIII, 1910, p. 224.
Rana arfaki, part., van Kampen, *Bijdr. Dierk.* XIX, 1913, p. 90.
Rana fallax, van Kampen, *Nova Guinea*, IX, *Zool.* p. 459 (1913).

Vomerine teeth in oblique groups or short series between the choanæ or extending posteriorly beyond them, equally distant from each other and from the latter or a little nearer each other.

Head as long as broad or longer than broad, much depressed; snout obtuse or more or less acutely pointed, projecting more or less beyond the mouth, as long as the eye or longer; canthus rostralis strong; loreal region moderately or feebly oblique, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or greater than the interorbital width, which is $\frac{3}{4}$ to once that of the upper eyelid, tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye, $1\frac{1}{2}$ to 3 times its distance from the latter.

Fingers long and slender, sometimes with a feeble dermal border, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb long, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or, usually, beyond the tip of the snout; the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $5\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, longer than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, the web reaching the disc, or only the penultimate phalanx of the fourth; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic,

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.
From snout to vent	51	72	71	71	74	74	73	68	100	100	80	73	66	57	56	51	73	73	65	78	108	103	71	71	69	61	110	60
Head ..	19	25	27	26	25	26	27	25	34	35	27	25	24	21	21	19	25	27	23	28	37	37	26	25	27	24	36	22
Width of head	17	23	24	24	22	22	22	21	34	33	25	23	21	18	18	16	23	26	21	27	37	36	24	23	25	22	36	20
Snout ..	6.5	9	11	10	11	11	11	10	12	12	11	10	10	8	7.5	8	10	11	9	11	14	15	10	10	10	9	15	8
Eye ..	6.5	9	9	9	9	9	9	9	12	12	10	9	9	7	7.5	7	9	9	8	9	13	13	9	9	9	8	12	7
Interorbital with	3	5	4	4	5	4	5	4	6	6	5	5	4	3.5	3.5	3	5	5	4	5	7	7	5	5	5	4	7	4
Tympanum	4	6	6	5	6	6	6	5.5	6	6	7	6	6	5	4.5	4	6	6	6	6	6	7.5	7	6	6	5	8	4
Fore limb	32	46	48	43	47	42	45	44	64	60	50	44	42	38	36	32	48	45	41	46	65	64	43	46	47	40	66	40
First finger	7.5	12	10	9	10	10	11	10	15	15	12	10	10	9	9	8	12	11	11	10	16	15	11	11	11	9	15	10
Second finger	6	9	9	8	9	9	9	9	12	13	10	9	8	8	8	7	9	9	9	9	12	12	9	9	9	8	12	8
Third finger	9	14	13	12	13	13	14	14	18	19	16	13	12	11	11	10	14	14	13	12	19	17	13	13	13	11	17	12
Fourth finger	6	9	8	8	8	9	9	9	12	13	11	9	8	7	7	6	8	9	8	8	13	12	8	9	8	8	12	8
Hind limb	90	118	140	132	135	137	136	134	182	188	131	123	118	100	100	102	130	126	110	138	189	190	136	130	137	119	184	110
Tibia ..	29	40	46	44	46	47	47	46	62	63	43	40	39	32	33	35	43	42	37	46	62	63	46	44	46	40	60	36
Foot ..	26	36	40	40	38	38	38	38	52	55	40	35	33	30	29	27	38	36	34	40	56	55	40	39	40	35	54	35
Third toe	14	20	21	21	22	21	21	22	29	30	22	18	15	16	16	14	21	20	19	21	30	30	21	21	21	19	31	19
Fourth toe	23	30	36	36	33	33	33	33	45	48	35	32	29	25	25	23	33	31	28	34	49	47	34	34	34	29	47	29
Fifth toe	15	22	23	23	25	24	24	24	31	34	24	20	19	18	18	15	23	21	20	25	34	33	24	25	25	21	35	20

1. Timor Laut. 2. Wakau, Aru. Ids. 3-4. Maunsam, Dutch New Guinea. 5-8. Fak Fak, Dutch N.G. 9-10. Utakwa R., Dutch N.G. 11-13. Mimika R., Dutch N.G. 14-19. Setikwa R., Dutch N.G. 20-22. Moroka, British N.G. 23-24. Dinawa, Brit. N.G. 25-26. Mt. Victoria, Owen Stanley Range. 27. Fergusson Id., Brit. N.G. 28. Murray Id., Torres Straits.

$\frac{1}{2}$ to $\frac{2}{3}$ the length of the inner toe; a round outer tubercle, exceptionally very indistinct.

Skin of upper parts smooth or finely granulate, sometimes with scattered small warts; a narrow glandular dorso-lateral fold from above the tympanum to the sacrum or to the hip, the distance between these folds, on the back, 5 to 6 times in the length of head and body; a glandular fold from below the eye to the shoulder, sometimes followed by one or two glandules. Lower parts smooth.

Olive, brown, or grey above, usually uniform, sometimes with darker spots on the back and sides; the dorso-lateral fold often edged with dark brown or black on the outer side; a dark brown or black streak below the canthus rostralis and a large temporal spot; tympanum sometimes reddish brown; the temporal spot often edged with whitish beneath; limbs with more or less distinct dark cross-bands; hinder side of thighs usually marbled with dark brown or black, sometimes with a light longitudinal streak. White or pale yellow beneath, throat and breast often spotted or marbled with brown.

Males with vocal sacs which are usually internal, but exceptionally external, though feebly developed, and forming folds on each side of the throat; fore limb strong, with a strong pad on the inner side of the first finger, covered, during the breeding season, with a velvety, greyish horny layer.

Nasal bones small, oblique, widely separated from each other and from the frontoparietals, which are grooved along the middle; ethmoid largely exposed above, extending to between the nasals; zygomatic process of squamosal longer than the posterior.

Habitat. New Guinea and neighbouring islands (Waigeou, Kei, Aru, Timor Laut, Fergusson, Murray, etc.).

I am unable to express an opinion on the specimens from Jobi, referred to *R. papua* by Barbour, Mem. Mus. Comp. Zool. XLIV, 1912, p. 65, pl. v, fig. 15, in which the male is provided with a humeral gland.

103. *Rana daemeli*.

Hylorana erythraea, part., Günth. *Ann. and Mag. N.H.* (3) XX, 1867, p. 56.

Hylorana daemeli, Steind. *Sitzb. Ak. Wien*, LVII, i, 1868, p. 532, pl. —.

Hylorana nebulosa, Macleay, *Proc. Linn. Soc. N.S.W.* 11, 1877, p. 137.

Rana papua, part., Bouleng. *Cat. Batr. Ecaud.* p. 64 (1882), and *Ann. and Mag. N.H.* (5) XVI, 1885, p. 387; Roux, *Abh. Senck. Ges.* XXXIII, 1910, p. 224.

Hyla nobilis, De Vis, *Proc. R. Soc. Queensl.* 1, 1884, p. 129.

Rana daemeli, Garman, *Bull. Mus. Comp. Zool.* XXXIX, 1901, p. 14; Bouleng. *Tr. Zool. Soc.* XX, 1914, p. 250, and *Ann. and Mag. N.H.* (9) I, 1918, p. 240.

Rana novæ-guineæ, van Kampen, *Nova Guinea*, IX, *Zool.* p. 37, pl. ii, fig. 5 (1909), and p. 459 (1913).

Vomerine teeth in oblique groups or short series between the choanæ or extending posteriorly a little beyond them, equally distant from each other and from the latter.

Head a little longer than broad, much depressed; snout obtusely pointed, projecting beyond the mouth, as long as the eye or longer; canthus rostralis strong; loreal region feebly oblique or nearly vertical, deeply concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye and 3 to 4 times its distance from the latter.

Fingers long and slender, sometimes with a narrow dermal border, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril; the heels feebly overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ to 4 times as long as broad, 2 to $2\frac{1}{2}$ times in length from snout to vent, much shorter than the fore limb, as long as or slightly longer or shorter than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, the web reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, $\frac{2}{3}$ the length of the inner; a round outer tubercle.

Skin of upper parts smooth or with a few scattered small warts; a moderately broad glandular dorso-lateral fold, from above the tympanum to the hip, the distance between these folds, on the back, 5 to $5\frac{1}{2}$ times in length of head and body; a glandular fold from below the eye to the shoulder, sometimes followed by one or two glandules. Lower parts smooth.

Greyish or reddish brown above, uniform or with small dark spots; flanks usually spotted or marbled with dark brown; loreal and temporal regions dark brown, tympanum reddish brown; a more or less distinct light streak along the upper lip, continued on the glandular fold behind the mouth; limbs with dark cross-bands; hinder side of thighs mottled or marbled with dark brown. White beneath, throat and breast sometimes marbled with brown.

Males with internal vocal sacs.

The eggs measure $1\frac{1}{2}$ millim. in a female 76 millim. long.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.
	♂	♀	♀	♀	♀	♀	♀
From snout to vent	58	80	76	71	42	41	40
Head	21	28	27	25	16	15	14
Width of head	20	26	25	23	13	13	12
Snout	9	11	11	9	6	6	5.5
Eye	7	9	9	8	6	6	5.5

		1.	2.	3.	4.	5.	6.	7.
		♂	♀	♀	♀	♀	♀	♀
Interorbital width	4	5	5	4	3	3
Tympanum	5.5	6	6	6	4	4
Fore limb	35	47	46	44	26	25
First finger	9	12	11	11	6.5	6
Second finger	7	9	10	9	6	5.5
Third finger	11	14	14	12	8	8
Fourth finger	7	9	9	8	5	5
Hind limb	91	123	115	110	65	62
Tibia	29	39	37	35	20	19
Foot	28	38	35	34	21	19
Third toe	14	19	18	18	11	10
Fourth toe	24	32	30	30	18	17
Fifth toe	15	22	22	22	12	11

1. Port Moresby. 2-4. Cape York. 5-7. Mimika R., Dutch New Guinea.

Habitat. Northern Queensland and New Guinea.

The shorter hind limbs distinguish this species from *R. papua*; in this respect there is complete agreement with *R. krefftii*, the male of which differs in the presence of external vocal sacs and of a humeral gland.

104. *Rana swinhoana*.

Rana swinhoana, Bouleng. *Ann. and Mag. N.H.* (7) XII, 1903, p. 556; Stejneger. *Herp. Zap.* p. 132 (1907).

Rana kosempensis, Werner, *Mitth. Nat. Mus. Hamb.* XXX, 1913, p. 48.

Vomerine teeth in short oblique series between the choanæ or extending beyond the level of their posterior borders, nearer to each other than to the latter.¹

Head as long as broad or slightly broader than long, much depressed; snout rounded, moderately projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril equally distant from the eye and the tip of the snout or a little nearer the latter; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, half the diameter of the eye, $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers moderately long, the tips dilated into moderately large discs with a groove separating the upper from the lower surface and measuring half the diameter of the tympanum; first finger as long as or slightly longer than the second; subarticular tubercles rather large and very prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels overlapping; tibia $3\frac{1}{2}$ to 5 times as long as broad, $1\frac{1}{2}$ to 2 times in length from snout to vent, shorter than the fore limb, a little longer than the foot. Toes with discs similar to those of the fingers, entirely webbed or two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large and prominent; no tarsal fold; inner metatarsal tubercle oval, feebly

¹ In the larger female from Kosempo, the vomerine teeth present a curious anomaly: they form a single V-shaped group just behind the level of the choanæ.

prominent, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the inner toe; outer tubercle small and very indistinct, or absent.

Skin smooth or finely granulate above; dorso-lateral fold absent or distinct only anteriorly; a glandular fold from below the eye to the shoulder, broken up behind; lower parts smooth, feebly granulate on the posterior part of the belly and of the thighs.

Brown or dark grey above, with small darker spots, flanks lighter, usually with black spots; a dark canthal streak and a dark temporal blotch; tympanum reddish brown; a whitish streak along the upper lip; limbs with rather indistinct dark cross-bands; hinder side of thighs yellowish, with black spots or marblings. Lower parts white.

Males with a large external vocal sac on each side of the throat in front of the arm; fore limb strong; a thick pad on the inner side of the first finger.

Nasal bones rather small, separated from each other; ethmoid largely exposed above, pointed in front, extending to between the nasals.

Eggs not pigmented, 3 millim. in diameter.

Measurements, in millimetres.

	1. ♀	2. ♀	3. ♂	4. ♀	5. ♀
From snout to vent ..	83	80	63	82	64
Head ..	26	26	23	27	22
Width of head ..	27	27	23	27	22
Snout ..	10	10	8	10	8
Eye ..	10	10	8	10	8
Interorbital width ..	6	6	4	5	5
Tympanum ..	5	5	4	5	4
Fore limb ..	49	48	40	48	42
First finger ..	10	10	7	9.5	9
Second finger ..	10	9	7	9	8.5
Third finger ..	15	13	11	14	12
Fourth finger ..	9	9	7	9	9
Hind limb ..	130	132	102	124	119
Tibia ..	42	43	34	40	39
Foot ..	40	38	30	38	36
Third toe ..	23	22	16	20	19
Fourth toe ..	35	33	25	30	29
Fifth toe ..	26	25	18	23	23

1-2. Bangkimtsing (types). 3-5. Kosempo.

Habitat. Formosa.

105. *Rana cavitympanum*.

Rana cavitympanum, Bouleng. *Proc. Zool. Soc.* 1893, p. 525, pl. xliii, fig. 1.

Vomerine teeth in short slightly oblique series between the choanæ, nearer to each other than to the latter.

Head as long as broad, much depressed; snout rounded, scarcely projecting beyond the mouth, a little shorter than the

eye; canthus rostralis strong; loreal region feebly oblique, deeply concave; nostril slightly nearer the eye than the tip of the snout; distance between the nostrils greater than the interorbital width, which is $\frac{3}{4}$ that of the upper eyelid; tympanum very distinct, deeply sunk, $\frac{1}{2}$ the diameter of the eye.

Fingers moderately long, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, measuring $\frac{1}{2}$ the diameter of the tympanum; first finger as long as the second, third longer than the snout; subarticular tubercles rather large and very prominent.

Hind limb extremely long, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $6\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ times as long as head and body, longer than the fore limb and than the foot. Toes entirely webbed, the discs similar to those of the fingers; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle oval, not quite $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth; no dorso-lateral fold.

Pale grey-brown above; a broad dorsal area blackish brown, sharply defined on the sides; a dark bar between the eyes; a black streak from the lip to the shoulder, passing through the nostril and eye and above the tympanum; lips with black spots; limbs with narrow dark brown cross-bars. Lower parts white.

Male with an external vocal sac on each side of the throat, in front of the ear; inner finger thickened at the base.

Tadpole with a large ventral sucking disc, free on its borders, truncate in front. Horny beak black, very finely denticulate on the edge; lip much developed, not fringed, with 3 uninterrupted and 8 interrupted rows of horny teeth in front, and 4 uninterrupted and 1 interrupted rows behind.

Measurements of type specimen (♂).

From snout to vent	..	..	..	..	44 millim.
Head	..	..	..	..	16 "
Width of head	..	..	..	..	16 "
Snout	..	..	..	..	5 "
Eye	..	..	..	..	6 "
Interorbital width	..	..	..	..	3 "
Tympanum	..	..	..	..	3 "
Fore limb	..	..	..	..	28 "
First finger	..	..	..	..	6 "
Second finger	..	..	..	..	6 "
Third finger	..	..	..	..	8 "
Fourth finger	..	..	..	..	6 "
Hind limb	..	..	..	..	90 "
Tibia	..	..	..	..	32 "
Foot	..	..	..	..	27 "
Third toe	..	..	..	..	14 "
Fourth toe	..	..	..	..	23 "
Fifth toe	..	..	..	..	17 "

Habitat. Mt. Kina Balu, Borneo.

106. *Rana whiteheadi*.

Rana whiteheadi, Bouleng. *Ann. and Mag. N.H.* (5) XX, 1887, p. 96; Mocquard, *N. Arch. Mus.* (3) II, 1890, p. 146, pl. x, fig. 2; Bouleng. *Ann. and Mag. N.H.* (6) VII, 1891, p. 344; Mocquard, *Mém. Soc. Zool. France*, V, 1892, p. 205; Bouleng. *Proc. Zool. Soc.* 1893, p. 526.

Vomerine teeth in short transverse or oblique series on a line with the posterior borders of the choanæ, or just behind them, equally distant from each other and from the latter, or closer together.

Head as long as broad or slightly longer than broad, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little longer or a little shorter than the eye, which is very large and prominent; canthus rostralis strong; loreal region feebly oblique, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which equals $\frac{2}{3}$ to once that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye, 1 to $2\frac{1}{2}$ times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, the discs as long as broad and measuring $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the tympanum; first finger as long as or longer than the second, third longer than the snout; subarticular tubercles rather large, very prominent.

Hind limb very long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 6 to 7 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, much longer than the foot. Toes with the tips dilated into discs similar to those of the fingers, completely webbed, or two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, $\frac{1}{4}$ to $\frac{1}{2}$ the length of the inner toe; outer tubercle very small and rather indistinct, or absent.

Skin finely granulate or shagreened above; a moderately prominent glandular fold above the tympanum, sometimes continued to about half-way between it and the second or followed by a series of warts. Lower parts smooth, or posterior part of belly and posterior half of thighs feebly granulate.

Dark grey, purplish brown, or reddish brown above, sometimes with darker spots or marblings, or with scattered small light spots; a blackish streak below the canthus rostralis and on the supratemporal fold; temporal region blackish or with blackish spots, the tympanum yellowish or pale brown with a dark brown or blackish central spot; limbs with or without more or less distinct dark cross-bands; hinder side of thighs purplish brown,

uniform or speckled with lighter. Lower parts white, uniform or spotted or marbled with brown.

Males with a small external vocal sac on each side of the throat, in front of the arm; fore limb strong; a large pad on the inner side of the first finger.

Nasal bones narrow, oblique, widely separated from each other; ethmoid largely exposed above, obtusely pointed in front, extending to between the nasals. Terminal phalanges T-shaped.

Tadpole with a large ventral sucking disc behind the mouth, free on its borders, truncate in front, tail obtusely pointed, the upper crest not extending to the base of the muscular part. Beak black, each mandible formed of two pieces, separated in the middle line by a considerable interspace; these pieces ribbed and strongly toothed; lips large, lower with a fringe of papillae; 2 uninterrupted and 3 lateral series of horny teeth in front, 4 uninterrupted and 1 lateral series behind.

Eggs 2 millim. in diameter.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	
	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	
From snout to vent	..	64	46	43	93	80	65	65	63	62	72	70	
Head	24	17	17	33	27	25	24	23	22	25	24	
Width of head	24	16	16	33	27	25	24	24	23	22	25	24
Snout..	..	8	6	5.5	12	10	9	9	9	8	8	10	9
Eye	8	7	6.5	12	10	9	9	9	8	8	9	8
Interorbital width	..	5	3.5	3	7	6	5	5	5	5	5	6	5
Tympanum	4	4	3	5	4	4.5	4.5	4.5	4.5	4	5	4
Fore limb	44	29	26	59	50	47	49	47	47	44	47	46
First finger	10	6	6	15	12	11	11	12	11	10	10	9
Second finger	10	6	6	14	11	10	10	10	10	9	8	9
Third finger	14	10	10	19	15	14	15	15	15	13	13	13
Fourth finger	10	6	6	14	9	9	10	11	11	9	9	9
Hind limb	131	92	90	180	158	135	136	138	138	131	138	142
Tibia	44	32	31	60	53	44	45	46	47	44	47	49
Foot	37	26	25	52	45	38	38	38	39	38	37	37
Third toe	20	14	14	30	25	21	21	22	22	20	22	22
Fourth toe	32	22	21	44	38	32	32	32	34	33	31	31
Fifth toe	24	16	16	35	30	23	24	24	25	24	25	25

1-10. Kina Balu. 11-12. Pata R.

Habitat. Borneo (Mt. Kinā Balu, N. Borneo, and Pata River, Sarawak).

107. *Rana jerboa.*

Hylorana jerboa, Günth. *Proc. Zool. Soc.*, 1872, p. 599, pl. xl.

Rana jerboa, Bouleng. *Cat. Batr. Ecaud.* p. 67 (1882), *Proc. Zool. Soc.* 1893, p. 526, and *Ann. Mus. Genova* (2) XIII, 1893, p. 335; M. Weber, *Ann. Jard. Bot. Buitenz.*, Suppl. II, 1898, p. 10, fig.; S. Flower, *Proc. Zool. Soc.* 1899, p. 916; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 199; van Kampen, in M. Weber, *Zool. Ergebn. Reise Nied. O.-Ind.* IV, p. 397 (1907), and *Tijdschr. Ned. Ind.* LXIX, 1909, p. 39, pl. ii, figs. 3-6; Bouleng., *Faun. Mal. Pen.*, Rept. p. 244 (1912).

Rana masonii, Bouleng. *Ann. and Mag. N.H.* (5) XIII, 1884, p. 397; Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 138

Vomerine teeth in short transverse or oblique series between the choanae or extending beyond the level of their posterior borders, equally distant from each other and from the choanae or a little nearer together.

Head as long as broad or a little longer than broad, much depressed; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis strong; loreal region feebly oblique and strongly concave; nostril equally distant from the eye and from the tip of the snout, or a little nearer the latter; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{1}{4}$ to $\frac{3}{4}$ the diameter of the eye, 1 to 4 times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, the discs as long as broad, much smaller than the tympanum ($\frac{1}{4}$ to $\frac{3}{4}$ its diameter); first finger as long as or longer than the second, third longer than the snout; subarticular tubercles large, very prominent.

Hind limb extremely long, slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 6 to $7\frac{1}{2}$ times as long as broad, $1\frac{1}{4}$ to $1\frac{1}{2}$ times in length from snout to vent, as long as or a little longer than the fore limb, much longer than the foot. Toes with discs similar to those of the fingers or a little larger, entirely webbed, the base of the discs of the third and fifth involved in the web; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, $\frac{1}{4}$ to $\frac{1}{2}$ the length of the inner toe; outer tubercle more or less distinct, rarely absent.

Skin of upper parts smooth or finely granulate; a moderately broad, moderately prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, $4\frac{1}{2}$ to $5\frac{1}{2}$ times in length from snout to vent. Lower parts smooth.

Pale brown, greyish brown, or reddish brown above, uniform or marbled with darker, dark brown on the sides of the head and sometimes of the body; sometimes a black streak on the canthus rostralis and along the outer side of the dorso-lateral fold, with a downward process in front of and another behind the tympanum, which is yellowish or reddish brown with a dark brown central spot; limbs with dark cross-bands, which may be very indistinct; hinder side of thighs speckled or vermiculate with dark brown, or marbled with dark brown and yellow. Lower parts white, or belly yellow, uniform, or throat and breast spotted or speckled with brown.

Males with a small external vocal sac on each side of the

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
From snout to vent	♀ 97	♀ 74	♀ 61	♀ 61	♀ 56	♀ 53	♀ 84	♂ 38	♀ 59	♂ 37	♂ 36	♂ 36	♂ 36	♀ 63	♀ 63	♀ 63	♀ 63	♂ 34	♀ 65	♀ 65	♂ 38
Head	.. 33	.. 25	.. 23	.. 22	.. 20	.. 19	.. 29	.. 14	.. 21	.. 14	.. 14	.. 14	.. 13	.. 23	.. 23	.. 23	.. 21	.. 13	.. 22	.. 25	.. 15
Width of head	.. 33	.. 25	.. 23	.. 21	.. 20	.. 18	.. 27	.. 11	.. 19	.. 11	.. 11	.. 11	.. 11	.. 20	.. 20	.. 20	.. 19	.. 11	.. 22	.. 23	.. 14
Snout ..	.. 13	.. 11	.. 9	.. 7	.. 8	.. 7	.. 11	.. 5	.. 9	.. 5	.. 5	.. 5	.. 5	.. 9	.. 8	.. 9	.. 9	.. 4.5	.. 9	.. 9	.. 5
Eye ..	.. 10	.. 9	.. 7	.. 7	.. 8	.. 7	.. 10	.. 5	.. 8	.. 5	.. 5	.. 5	.. 5	.. 8	.. 8	.. 7	.. 8	.. 5	.. 9	.. 8	.. 5
Interorbital width	.. 7	.. 6	.. 5	.. 5	.. 4.5	.. 4	.. 6	.. 3	.. 5	.. 3	.. 3	.. 3	.. 3	.. 4	.. 4	.. 4	.. 4	.. 3	.. 4.5	.. 5	.. 3
Tympanum	.. 5	.. 5	.. 4	.. 4	.. 4	.. 4	.. 5	.. 3.5	.. 4.5	.. 3	.. 3	.. 3	.. 3	.. 4	.. 4	.. 4	.. 4	.. 3	.. 4.5	.. 5	.. 3
Fore limb	.. 61	.. 48	.. 44	.. 45	.. 42	.. 39	.. 55	.. 24	.. 36	.. 25	.. 24	.. 25	.. 24	.. 41	.. 39	.. 40	.. 41	.. 22	.. 43	.. 47	.. 22
First finger	.. 13	.. 11	.. 9	.. 9	.. 8	.. 8	.. 12	.. 5	.. 9	.. 5.5	.. 5.5	.. 5.5	.. 5.5	.. 10	.. 8	.. 9	.. 9	.. 4.5	.. 9	.. 10	.. 4.5
Second finger	.. 13	.. 10	.. 9	.. 9	.. 8	.. 7	.. 11.5	.. 5	.. 8	.. 5	.. 5	.. 5	.. 5	.. 8	.. 7	.. 8	.. 8	.. 4	.. 8	.. 9.5	.. 4
Third finger	.. 16	.. 15	.. 14	.. 14	.. 12	.. 11	.. 16	.. 8	.. 12	.. 8	.. 8	.. 8	.. 8	.. 13	.. 12	.. 12	.. 12	.. 6	.. 13	.. 14	.. 6
Fourth finger	.. 12	.. 9	.. 9	.. 9	.. 8	.. 7	.. 11	.. 5	.. 8	.. 5	.. 5	.. 5	.. 5	.. 9	.. 7	.. 8	.. 8	.. 4	.. 9	.. 10	.. 4
Hind limb	.. 189	.. 152	.. 136	.. 136	.. 132	.. 126	.. 172	.. 82	.. 123	.. 77	.. 75	.. 77	.. 78	.. 135	.. 130	.. 132	.. 130	.. 71	.. 138	.. 145	.. 71
Tibia ..	.. 66	.. 52	.. 44	.. 45	.. 45	.. 42	.. 60	.. 28	.. 43	.. 27	.. 26	.. 26	.. 27	.. 47	.. 45	.. 46	.. 44	.. 25	.. 47	.. 47	.. 25
Foot	.. 55	.. 42	.. 38	.. 37	.. 34	.. 33	.. 47	.. 22	.. 35	.. 20	.. 21	.. 21	.. 21	.. 36	.. 36	.. 36	.. 36	.. 19	.. 33	.. 40	.. 19
Third toe	.. 29	.. 25	.. 23	.. 22	.. 21	.. 20	.. 28	.. 12	.. 18	.. 11	.. 11	.. 12	.. 12	.. 20	.. 20	.. 20	.. 20	.. 11	.. 19	.. 22	.. 11
Fourth toe	.. 47	.. 36	.. 32	.. 32	.. 29	.. 29	.. 41	.. 29	.. 28	.. 17	.. 17	.. 18	.. 18	.. 31	.. 31	.. 31	.. 31	.. 16	.. 29	.. 35	.. 16
Fifth toe	.. 36	.. 30	.. 26	.. 25	.. 24	.. 24	.. 32	.. 15	.. 22	.. 13	.. 13	.. 14	.. 14	.. 25	.. 25	.. 25	.. 24	.. 13	.. 24	.. 26	.. 13

1. Kareni hills, Burma. 2. Me Wang, N. Siam. 3-4. Siolak Daru, Korinchi, Sumatra. 5-6. Matang, Sarawak (types). 7. Mt. Dulit, Sarawak. 8-9. Kidi district, Sarawak. 10-17. Sarawak. 18-19. Luras, Brunei, Borneo. 20. Batavia (type of *R. masoni*). 21. Tengger Mts., Java.

throat; fore limb strong; a moderately thick pad on the inner side of the first finger.¹

Nasal bones small, widely separated from each other; ethmoid exposed above, truncate or rounded in front, not extending to the nasals. Terminal phalanges T-shaped.

Tadpole with a large ventral sucking disc behind the mouth, free on its borders, truncate in front; tail pointed, the upper crest not extending to the base of the muscular part. Beak black, the edge feebly denticulate; lip much developed, not fringed, with 4 series of horny teeth in front, the outermost uninterrupted, and 4 behind, only the inner interrupted. This definition is taken from specimens from Bantam, Java, which I have referred to *R. jerboa*.

Tadpoles obtained by Max Weber in Java, and referred to the same species by van Kampen, differ in having small papillae on the

edge of the lip and 8 upper and 8 lower series of labial teeth $\left(\frac{4-4}{1-1}\right)^4$.

Which of the two tadpoles really belongs to *R. jerboa* is still a question, awaiting a solution until we know the larval form of *R. hosii*, which also inhabits Java, and the foot of which can hardly be distinguished from that of *R. jerboa*.

Eggs $1\frac{1}{2}$ millim. in diameter, strongly pigmented.

Habitat. Burma (Karen hills), Siam, Malay Peninsula, Sumatra, Borneo, Java.

108. *Rana hosii*.

Rana hosii, Bouleng. *Ann. and Mag. N.H.* (6), VIII, 1891, p. 290, and *Journ. Fed. Mal. St. Mus.* III, 1908, p. 62; van Kampen, in M. Weber, *Zool. Ergebn. Reise Nied. O.-Ind.* IV, p. 398 (1907), and *Bull. Dép. Agric. Ind. Néerl.* XXV, 1909, p. 2; Bouleng. *Faun. Mal. Pen., Rept.* p. 243 (1912); van Kampen, *Notes Lev. Mus.* XXXVI, 1914, p. 260, *Rana durheimi*, Baumann, *Zool. Jahrb., Syst.* XXXIV, 1913, p. 275, fig.

Vomerine teeth in strong oblique series between the choanae and extending beyond the level of their posterior borders, equally distant from each other and from the latter, or nearer together.

Head as long as broad or slightly longer than broad, much depressed; snout rounded or obtusely pointed, more or less projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis strong; loreal region slightly oblique or nearly vertical, deeply concave; nostril nearer the end of the snout than the eye; distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye, $1\frac{1}{2}$ to 3 times as long as its distance from the latter.

Fingers moderately long, the tips dilated into large discs with a groove separating the upper from the lower surface, those of the third and fourth as large as or a little smaller than the tympanum;

¹ The statement previously made by me that the vocal sacs are internal and that the tympanum is larger is due to a confusion with *R. hosii*.

first finger as long as the second, third longer than the snout; sub-articular tubercles large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $4\frac{1}{2}$ to $5\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $1\frac{1}{3}$ times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, the web extending to and involving the base of the discs; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle elliptic, $\frac{2}{3}$ to $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Upper parts feebly granulate; a feebly prominent, sometimes very indistinct, glandular dorso-lateral fold from above the tympanum to the sacrum or to the hip, its distance from its fellow, on the back, 5 to 6 times in length from snout to vent; a glandular fold from below the eye to the shoulder, often followed by one or two glandules. Lower parts smooth.

Uniform purplish brown above, darker on the sides, especially on the head; a white or whitish streak along the upper lip; limbs with darker cross-bands, which may be very indistinct. Lower parts white, uniform or spotted or marbled with brown.

Males with internal vocal sacs; fore limb strong; a moderately strong pad on the inner side of the first finger.

Nasal bones rather small, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, truncate in front, not extending to between the nasals. Terminal phalanges T-shaped.

Eggs not pigmented, 2 to $2\frac{1}{2}$ millim. in diameter.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
	♂	♂	♀	♀	♂	♀	♂	♂	♀	♀	♀	♀	♀
From snout to vent	.. 50	48	85	82	57	85	97	49	49	90	97	97	95
Head	.. 18	17	28	27	19	30	30	16	17	28	30	31	30
Width of head	.. 16	15	27	27	19	30	30	16	16	28	30	31	30
Snout	.. 7	7	11	11	8	12	13	7	8	12	12	12	12
Eye	.. 7	7	10	11	8	11	12	7	7	10	12	12	12
Interorbital space	.. 4	4	6	6	5	7	6	4	4	6	7	7	7
Tympanum	.. 4	4	5	5	4	5	5	4	4	5	6	6	6
Fore limb	.. 33	33	53	55	39	63	63	32	32	58	66	66	63
First finger	.. 6	6	11	11	8	14	13	7	7	12	13	14	13
Second finger	.. 6	6	11	11	8	14	13	7	7	12	13	14	13
Third finger	.. 10	10	16	17	12	22	20	11	11	19	20	22	20
Fourth finger	.. 6	6	11	12	8	15	14	7	8	13	13	16	14
Hind limb	.. 98	87	156	155	110	173	167	90	90	158	176	178	167
Tibia	.. 33	29	51	50	36	56	55	31	31	51	58	60	56
Foot	.. 28	25	45	46	32	53	49	26	27	49	52	51	50
Third toe	.. 15	15	25	26	18	31	30	15	16	30	31	30	30
Fourth toe	.. 23	21	37	40	27	45	44	22	23	43	46	45	44
Fifth toe	.. 18	16	30	30	21	34	34	17	18	33	36	36	35

1. Bukit Itam, Selangor. 2-4. Kuthla Tehu, Pahang. 5-6. Siolak Daras, Korinchi, Sumatra. 7. Mt. Dulit, Sarawak (type). 8-10. Mt. Batu Song, Sarawak. 12-13. Sarawak.

Hab. Malay Peninsula, Sumatra, Borneo, Java.

109. *Rana chalconota.*

Hyla chalconota, Schleg. *Abbild.* p. 24, pl. ix, fig. 1 (1837).

Polydectes chalconotus, Tschudi, *Class. Batr.* p. 34 (1838).

Limnodytes chalconotus, Dum. et Bibr. *Erp. Gén.* VIII, p. 513 (1841).

Polydectes junghuhnii, Bleek. *Nat. Tijdschr. Ned. Ind.* XI, 1856, p. 469.

Hylarana chalconota, Günth. *Cat. Batr. Sal.* p. 73 (1858).

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Rana labialis, Bouleng. *Ann. and Mag. N.H.* (5) XIX, 1887, p. 345, pl. x, fig. 1, and *Ann. Mus. Genova* (4) XIV, 1894, p. 617; S. Flower, *Proc. Zool. Soc.* 1896, p. 903, pl. xlv, fig. 3; Peracca, *Rev. Suisse Zool.* VII, 1899, p. 329; Laidlaw, *Proc. Zool. Soc.* 1900, p. 886; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 199; Bouleng. *Faun. Mal. Pen., Rept.* p. 242 (1913).

Rana everetti, part., Bouleng. *Proc. Zool. Soc.* 1897, p. 232; van Kampen, *op. cit.* p. 394.

Rana mocquardii, Werner, *Zool. Anz.* XXIV, 1901, p. 98.

Rana erythraea (non Schleg.), Isenschmid, *t. c.* p. 7.

Rana tytleri, part., Isenschmid, *t. c.* p. 11.

Vomerine teeth in short oblique series between the choanae or extending a little beyond the level of their posterior borders, equally distant from each other and from the choanae.

Head longer than broad, much depressed; snout rounded or more or less pointed, more or less projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little greater or a little less than that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{5}{8}$ the diameter of the eye, close to it or at least 3 times as long as its distance from it.

Fingers rather long and slender, with slight dermal border, the tips dilated into large discs, those of the third and fourth measuring $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the tympanum, bearing a groove separating the upper from the lower surface; first finger as long as or slightly shorter than the second; subarticular tubercles large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to 6 times as long as broad, $1\frac{1}{2}$ to 2 times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth usually free; outer metatarsals separated nearly to the base; subarticular tubercles rather small, prominent; inner metatarsal tubercle oval, $\frac{1}{4}$ to $\frac{1}{2}$ the length of the inner toe; a more or less distinct small round outer tubercle.

Skin smooth or granulate above, sometimes with small warts on the back; a more or less distinct, often rather broad, moder-

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.			
From snout to vent	♂	♀	♂	♂	♂	♀	♀	♀	♀	♂	♂	♀	♀	♀	♂	♂	♂	♂	♀	♀	♂	♂	♂	♂	♂	♂	♀			
Head	33	53	36	35	34	49	45	42	36	47	53	58	52	51	41	40	43	42	60	57	43	64	44	44	45	42	66		
Width of head	13	21	14	13	17	16	15	14	17	20	20	19	19	15	15	16	16	21	20	16	23	17	17	18	15	23		
Snout	9	17	10	10	14	13	12	11	14	17	16	15	16	13	12	13	13	18	18	15	21	13	14	15	12	20		
Eye	4.5	8	6	5.5	4.5	7	7	6	6.5	8	8	7	7	6	5.5	6	6	8	8	6	9	6	6	7	5.5	9		
Interorbital width	3.5	7	5	5	4.5	6	6	5	6.5	8	7	7	7	6	5.5	6	7	7	6	8	6	6	6	6	5.5	8		
Tympanum	3	4	3	3	3	4	4	3.5	4	4	3.5	5	5	4.5	3.5	3	3.5	3	5	4.5	3.5	4	4	3.5	3.5	4	5	
Pore limb	3.5	5	3.5	3.5	4	4	4	3.5	3.5	5	5	5	5	4.5	4.5	4	4.5	4.5	5	4.5	4	5	5	3.5	3.5	4	5	
First finger	20	39	22	22	31	28	24	22	31	35	39	34	35	26	25	27	28	40	36	28	46	30	32	30	29	47		
Second finger	4	7	4.5	4.5	4.5	6	5	5	6	7	7	6	7	4.5	4.5	4.5	4.5	8	7	5	9	5	6.5	5.5	5	9		
Third finger	4	7.5	4.5	4.5	4.5	6	5.5	5	6.5	7	7.5	6.5	7	5	5	5	5	8	7	5.5	9	6	7	6	5	9		
Fourth finger	6	12	7	7	7	9	9	8	7	11	11	12	11	12	8	8	8	13	11	9	15	9	11	9	8	15	10	
Hind limb	3.5	7.5	4	4	4	6	5	4.5	5	6	8	7	6	8	6	5.5	5.5	5.5	8	7	5.5	9	7	7	7	5	10	
Tibia	56	105	62	57	57	84	75	68	62	81	100	96	88	88	70	66	72	71	103	90	77	113	73	79	78	75	134	
Foot	19	35	21	19	19	29	26	23	21	27	32	30	30	24	22	24	24	33	29	25	36	25	26	25	24	41	..	
Third toe	16	30	17	17	17	23	22	19	18	24	30	28	25	27	20	19	21	22	31	27	22	35	20	22	23	21	35	..
Fourth toe	8	16	9	9	9	13	12	11	10	14	15	14	13	11	10	12	12	16	14	12	18	11	12	12	11	19	..	
Fifth toe	13	25	15	14	14	19	18	17	15	21	24	24	20	22	16	16	17	18	27	23	19	30	17	18	19	17	30	
	9	19	9	10	10	14	13	12	11	16	18	18	15	16	12	12	13	14	20	16	14	23	13	13	13	13	23	

1-2

Kuala Lumpur, Selangor.

3-8.

Malacca (types of *R. labialis*).

9.

Singapore.

10.

Sereinu, Mentawai.

11.

Mt. Ophir, Padang Batu, Sumatra.

12-14.

Matang, Sarawak.

15-16.

Sarawak.

17-20.

Pengalangan, Java.

21-22.

Cape Engano, N. Luzon.

24.

Masarang Chain, Celebes.

25.

Bone Valley, Celebes.

26-27.

Luhur, S. Celebes.

1-2 Kuala Lumpur, Selangor. 3-8. Malacca (types of *R. labialis*). 9. Singapore. 10. Sereinu, Mentawai. 11. Mt. Ophir, Padang Batu, Sumatra. 12-14. Matang, Sarawak. 15-16. Sarawak. 17-20. Pengalengan, Java. 21-22. Java. 23. Cape Engano, N. Luzon. 24. Masaraung Chain, Celebes. 25. Bone Valley, Celebes. 26-27. Luhu, S. Celebes.

ately or feebly prominent glandular dorso-lateral fold from above the tympanum to the sacrum; or if to the hip, often broken up behind, its distance from its fellow, on the back, 5 to 6 times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by one or two glandules. Posterior half of thighs and usually of belly granulate.

Bright green or bronze-brown above (brown or purple in spirit), sides dark green or dark brown, with rather indistinct darker spots; back sometimes with small dark spots; tympanum often reddish brown; a white or golden streak on the upper lip; limbs with more or less distinct dark cross-bands. Whitish beneath, throat and breast often spotted or marbled with brown.

Males with internal vocal sacs; fore limb strong.

Nasal bones moderately large, separated from each other and from the frontoparietals; ethmoid largely exposed above, pointed in front, extending to between the nasals.

Tadpole with the tail pointed, about twice as long as the body. Beak broadly edged with black; upper lip with 4 series of horny teeth, the outermost marginal and uninterrupted, the others interrupted; lower lip with 3 series of horny teeth, all or only the two outer uninterrupted.

Eggs measuring $1\frac{1}{2}$ millim. in female 58 millim. long from snout to vent.¹

Habitat. Malay Peninsula, Sumatra, Mantawei Islands, Borneo, Java, Celebes, Philippines.

I now regard *R. labialis*, from the Malay Peninsula, as a variety of the typical *R. chalconota* from Java, from which it differs in the usually shorter foot as compared with the tibia, the rather more slender hind limbs, and the smaller size; but intermediate specimens completely connect the two extreme forms.

110. *Rana macrops*.

Rana macrops, Bouleng. *Proc. Zool. Soc.* 1897, p. 233, pl. xvi, fig. 1.

Vomerine teeth in very small oblique groups between the choanae, or close together just behind them.

Head as long as broad, much depressed; snout rounded, projecting beyond the mouth, shorter than the eye, which is very large; canthus rostralis strong; loreal region nearly vertical, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital space or the width of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ the diameter of the eye, $1\frac{1}{2}$ to 2 times its distance from the latter.

Fingers long and slender, the tips dilated into rather large discs, with a groove separating the upper from the lower surface, and measuring $\frac{3}{4}$ to $\frac{5}{8}$ the diameter of the tympanum; first finger as long as the second, third much longer than the snout; subarticular tubercles moderately large, prominent.

¹ The Drs. Sarasin have observed this frog in Celebes to lay its eggs in a frothy mass out of the water, forming a sort of nest as in some *Rhacophorus*.

Hind limb long and rather slender, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 5 times as long as broad, $1\frac{3}{4}$ to $1\frac{1}{2}$ times in length of head and body, shorter than the fore limb, a little longer than the foot. Toes with discs similar to but a little smaller than those of the fingers, $\frac{2}{3}$ webbed; outer metatarsals separated nearly to the base; subarticular tubercles moderate, prominent; no tarsal fold; inner metatarsal tubercle elliptic or oval, $\frac{1}{2}$ to $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, sometimes with a few small flat warts on the back; glandular dorso-lateral fold very feebly developed and distinct only anteriorly. Lower parts smooth.

Olive-green above; a blackish streak below the canthus rostralis; a blackish band on the temporal region and above the shoulder, broken up into spots posteriorly; sides greyish, marbled with dark brown; a whitish streak from below the eye to above the arm; limbs with more or less distinct dark cross-bands; hinder side of thighs marbled with dark brown. Brownish beneath, throat dark brown, with or without small white spots.

Male with internal vocal sacs and an oval flat gland at the base of the arm.

Measurements in millimetres, of types, from Masarang.

				♂	♀
From snout to vent	..	..	..	30	32
Head	..	..	..	12	12
Width of head	..	..	..	12	12
Snout	..	..	..	4	4
Eye	..	..	..	5	5
Interorbital width	..	..	..	3	3
Tympanum	..	..	..	2.5	2.5
Fore limb	..	..	..	25	23
First finger	..	..	..	4.5	4
Second finger	..	..	..	4.5	4
Third finger	..	..	..	7	7
Fourth finger	..	..	..	5	4.5
Hind limb	..	..	..	58	56
Tibia	..	..	..	19	18
Foot	..	..	..	17	16
Third toe	..	..	..	8	8
Fourth toe	..	..	..	14	13
Fifth toe	..	..	..	10	9

Habitat.—Mountains of Celebes, between 3,000 and 3,300 feet.

III. *Rana graminea*.

Rana graminea, Bouleng. *Proc. Zool. Soc.* 1899, p. 958, p. lxxvii, fig. 1.

Vomerine teeth in short oblique series between the choanae, nearer to each other than to the latter.

Head a little longer than broad, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis strong, loreal region

feebly oblique or nearly vertical, concave; nostril equally distant from the eye and from the end of the snout or a little nearer the latter; distance between the nostrils greater than the interorbital width, which measures $\frac{3}{4}$ to $\frac{2}{3}$ that of the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{1}{2}$ the diameter of the eye, 5 to 6 times its distance from the latter.

Fingers rather slender, with moderately large discs measuring $\frac{1}{2}$ to $\frac{1}{3}$ the diameter of the eye, bearing a groove separating the upper from the lower surface; first and second fingers equal, third longer than the snout; subarticular tubercles moderately large, prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the tibia reaching the axil, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $5\frac{1}{2}$ to 6 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with the discs similar to but a little smaller than those of the fingers, entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle elliptic, $\frac{1}{2}$ to $\frac{3}{4}$ the length of the inner toe; no outer tubercle.

Skin smooth; a moderately broad, feebly prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 5 times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by a strong glandule.

Bright green above, brownish on the sides of the head and body, below the canthus rostralis and the dorso-lateral fold, and on the limbs; upper lip white; limbs with regular dark cross-bands; hinder side of thighs marbled dark brown and yellow. Lower parts white.

Males with an external vocal sac in front of the arm; fore limbs strong.

Measurements, in millimetres.

			1.	2.	3.
			♂	♂	♂
From snout to vent	..	..	47	45	50
Head	..	..	18	18	20
Width of head	..	..	16	16	17
Snout	..	..	6	6	7
Eye	..	..	7	7	7
Interorbital width	..	..	3.5	3.5	3.5
Tympanum	..	..	5.5	5	4.5
Fore limb	..	..	32	32	33
First finger	..	..	6	6	6
Second finger	..	..	6	6	6
Third finger	..	..	9	9	9
Fourth finger	..	..	6	6	6
Hind limb	..	..	92	90	94
Tibia	..	..	30	30	31
Foot	..	..	27	26	29
Third toe	..	..	15	15	16
Fourth toe	..	..	23	22	24
Fifth toe	..	..	17	17	19

1-2. Five-finger Mts., Hainan (types). 3. Man Son Mts., Tonkin.

Habitat.—Mountains of Hainan and Tonkin near the Kwangsi frontier.

112. *Rana monticola*.

Hylorana monticola, Anders. *Journ. As. Soc. Beng.* XI., 1871, p. 25;

Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 105.

? *Hylorana pipiens*, Stoliczka, *t. c.* p. 106.

Rana monticola, Bouleng. *Faun. Ind., Rept.* p. 461 (1890).

Vomerine teeth in oblique groups between the choanae, equally distant from each other and from the latter, or a little nearer to each other.

Head as long as broad or a little longer than broad, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril equally distant from the eye and from the tip of the snout; distance between the nostrils equal to the interorbital width or to that of the upper eyelid; tympanum distinct, $\frac{1}{2}$ to $\frac{1}{2}$ the diameter of the eye, and $\frac{2}{3}$ to $1\frac{1}{2}$ times its distance from the latter.

Fingers long and slender, terminating in rather large discs, equal to or a little smaller than the tympanum, as long as broad and bearing a groove separating the upper from the lower surface; first and second fingers equal, third longer than the snout; sub-articular tubercles moderately large, prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $5\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes ending in rather large discs, but a little smaller than those of the fingers, nearly entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle oval, $\frac{1}{3}$ the length of the inner toe; no outer tubercle.

Skin of upper parts smooth; a narrow, feebly prominent, glandular dorso-lateral fold from above the tympanum to the hip, the distance between the two folds, on the back, 5 times in the length from snout to vent; a glandular fold from below the eye to the shoulder, followed by one or two glandules. Lower parts smooth.

Grey or brown above, uniform or with darker spots, sides sometimes darker; a dark brown canthal streak and a large temporal spot; a light streak along the upper lip to the shoulder; limbs with dark cross-bands. Yellowish white beneath.

Males with an external vocal sac on each side of the throat; limbs very strong; a strong pad on the inner side of the first finger.

Nasal bones small, oblique, widely separated from each other and from the frontoparietals; ethmoid exposed but not extending to between the nasals. Terminal phalanges T-shaped.

Measurements, in millimetres.

				1. ♂	2. ♀
From snout to vent	..	..	..	41	65
Head	..	..	..	16	20
Width of head	..	..	..	15	20
Snout	..	..	..	5	7
Eye	..	..	..	5	7
Interorbital width	..	..	..	3	4.5
Tympanum	..	..	..	2.5	2.3 ¹
Fore limb	..	..	..	32	43
First finger	..	..	..	5	7.5
Second finger	..	..	..	5	7.5
Third finger	..	..	..	7	13
Fourth finger	..	..	..	5	8
Hind limb	..	..	..	81	121
Tibia	..	..	..	26	41
Foot	..	..	..	24	36
Third toe	..	..	..	15	21
Fourth toe	..	..	..	21	30
Fifth toe	..	..	..	15	23

1. Darjiling. 2. Darjiling (type).

Habitat. Darjiling. The types are from an altitude of 3,500 feet.

113. *Rana gerbillus*.

Rana gerbillus, Annand. *Rec. Ind. Mus.* VIII, 1912, p. 10, pl. ii, fig. 1.

Vomerine teeth in two small roundish groups or oblique series between the choanae or on a level with their posterior borders.

Head as long as broad; snout rounded, feebly projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril a little nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum distinct, $\frac{1}{3}$ to $\frac{2}{3}$ the diameter of the eye, 1 to $1\frac{1}{3}$ times its distance from the latter.

Fingers slender, with large discs, that of the third as large as or rather larger than the tympanum; first finger shorter than the second, third longer than the snout.

Hind limb very long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout; tibia 6 times as long as broad, $1\frac{1}{3}$ to $1\frac{2}{3}$ times in length from snout to vent, longer than the foot. Toes with the discs smaller than those of the fingers, nearly completely webbed; subarticular tubercles large but not prominent, oval; no tarsal fold; a flat, oval inner metatarsal tubercle; no outer tubercle.

Back smooth or obscurely granulate, sometimes with large compressed longitudinal tubercles scattered more especially on the sides; a distinct glandular dorso-lateral fold. Lower parts smooth.

The young type specimen is described as very dark grey above, obscurely mottled with a paler shade; lips with pale vertical bars; sides pale, spotted with dark grey; limbs with dark cross-bands.

¹ The size of the tympanum is very different on the two sides.

Dull greenish yellow beneath, with large round or oval brown spots on the throat and breast.

The adult female which I refer to this species and of which measurements are here given, is greyish brown above, unspotted, with a blackish streak from the tip of the snout, through the eye and above the tympanum, to the hip, bordering the dorso-lateral fold; a whitish streak on the upper lip; limbs with dark cross-bands. Lower parts unspotted.

Male unknown.

Measurements.

					Millim.
From snout to vent	..	..	..	..	60
Head	..	..	..	..	18
Width of head	..	..	..	..	18
Snout	..	..	..	..	7
Eye	..	..	..	..	7
Interorbital width	..	..	..	..	4.5
Tympanum	..	..	..	..	3
Fore limb	..	..	..	..	39
First finger	..	..	..	..	7
Second finger	..	..	..	..	8
Third finger	..	..	..	..	11
Fourth finger	..	..	..	..	8
Hind limb	..	..	..	..	112
Tibia	..	..	..	..	38
Foot	..	..	..	..	31
Third toe	..	..	..	..	19
Fourth toe	..	..	..	..	27
Fifth toe	..	..	..	..	19

Habitat. The type, a young specimen 33 millim. long from snout to vent, preserved in the Indian Museum, is from Yembung, Abor foot-hills (1,100 feet), Assam. I refer to the same species two specimens from Pashok (3,500 feet), Darjiling district (L. C. Hartless), also preserved in the Indian Museum.

114. *Rana luzonensis*.

Rana luzonensis, Bouleng. *Ann. and Mag. N.H.* (6) XVII, 1896, p. 401.

Vomerine teeth in oblique groups on a level with the posterior borders of the choanae and extending beyond them, nearer to each other than to the choanae.

Head as long as broad or slightly longer than broad, much depressed; snout acutely pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis strong; loreal region nearly vertical, concave; nostril nearer the end of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which equals that of the upper eyelid; tympanum very distinct, $\frac{1}{3}$ to $\frac{1}{2}$ the diameter of the eye, 2 to 4 times as long as its distance from the latter.

Fingers long and slender, the tips dilated into large round discs, with a groove separating the upper from the lower surface, the largest measuring $\frac{1}{3}$ to $\frac{1}{2}$ the diameter of the tympanum; first finger a little shorter than the second; subarticular tubercles rather large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 6 to $6\frac{1}{2}$ times as long as broad, $1\frac{1}{4}$ to $1\frac{1}{2}$ times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{1}{4}$ the length of the inner toe; outer tubercle very small or absent.

Skin smooth; a narrow glandular dorso-lateral fold, from above the tympanum to the hip, its distance from its fellow, on the back, 6 to 7 times in length from snout to vent.

Greyish or olive above, with or without a narrow light vertebral streak; a blackish canthal streak and temporal spot; tympanum reddish brown; upper lip with a light dark-edged streak; limbs with dark cross-bands. Whitish beneath, throat and breast sometimes brown.

Male unknown.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid exposed above, truncate in front, not extending to the nasals.

Measurements of types, in millimetres.

From snout to vent	..	..	58	43	38	37
Head ..	..	..	20	15	14	14
Width of head ..	..	..	20	15	14	13
Snout ..	..	..	8	7	6	6
Eye ..	..	..	6	5.5	5	5
Interorbital width ..	..	..	4	3.5	3	3
Tympanum ..	..	..	4	3	3	3
Fore limb ..	..	..	42	31	28	27
First finger ..	..	..	8	6	5	4.5
Second finger ..	..	..	9	6.5	5.5	5
Third finger ..	..	..	14	10	9	9
Fourth finger ..	..	..	9	6.5	5.5	5.5
Hind limb ..	..	..	115	86	75	73
Tibia ..	..	..	37	29	26	25
Foot ..	..	..	33	26	21	21
Third toe ..	..	..	17	12	11	11
Fourth toe ..	..	..	29	21	18	18
Fifth toe ..	..	..	21	15	14	14

Habitat. This species is known from four specimens (female and half-grown) from the highlands of Lepauto, Luzon, Philippines.

115. *Rana mearnsii*.

Rana mearnsi, Stejneger. *Proc. U. S. Nat. Mus.* XXVIII, 1905, p. 343.

Vomerine teeth in oblique groups commencing on a line with the hinder edge of the choanae.

Head longer than broad; snout rather pointed, considerably longer than the eye; canthus rostralis well marked; loreal region concave; nostril nearer the tip of the snout than the eye; inter-

orbital space broader than the upper eyelid; tympanum very distinct, about $\frac{2}{3}$ the diameter of the eye.

Fingers very long, the third and fourth with very large discs, which are pointed anteriorly; first finger much shorter than the second.

Hind limb long, the tibio-tarsal articulation reaching considerably beyond the tip of the snout; tibia $1\frac{1}{2}$ times the length of head and body. Toes with the tips dilated into small discs about the size of that of the first finger, nearly entirely webbed; a feeble inner metatarsal tubercle, about $\frac{1}{4}$ the length of the inner toe.

Skin smooth above, with a distinct patch of minute pointed pustules on the posterior two-thirds of the upper eyelid, and a similar one, with the pustules somewhat wider apart, above the tympanum; a distinct but very narrow glandular dorso-lateral fold. Throat and breast smooth, belly and posterior lower surface of thigh coarsely granulate.

Olive-green above, the dorsal side of the head and back defined by a sharply marked yellow streak; sides of head purplish brown; edge of upper lip yellowish; indications of obscure dark cross-bars on the limbs; hinder side of thighs dark purplish grey, sending upward a triangular projection to include the vent; below the latter, in the dark area, two sharply defined round yellow spots. Uniform pale yellow beneath.

From snout to vent 62 millim.

Habitat. Mindanao, Philippine Islands. Type in U.S. National Museum.

116. *Rana everetti*.

- Rana everetti*, Bouleng. Cat. Batr. Etand p 72, pl 11 (1882), Mocquard, Nouv. Arch. Mus. (3) II, 1890, p 148

Vomerine teeth in short oblique series on a level with and extending beyond the posterior borders of the choanae, to which they are nearer than to each other.

Head as long as broad, much depressed; snout rounded, scarcely projecting beyond the mouth, a little longer than the eye; canthus rostralis strong; loreal region very feebly oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width or to that of the upper eyelid; tympanum very distinct, $\frac{1}{2}$ the diameter of the eye, $\frac{1}{4}$ times as long as its distance from the latter.

Fingers long and slender, the tips dilated into large discs with a groove separating the upper from the lower surface, those of the third and fourth $\frac{2}{3}$ the diameter of the tympanum; first and second fingers equal, third longer than the snout; subarticular tubercles moderately large, very prominent.

Hind limb rather long and slender, the tibio-tarsal articulation reaching between the eye and the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 times as long as broad, $1\frac{1}{2}$ times in length from snout to

vent, shorter than the fore limb, a little longer than the foot. Toes with discs similar to those of the fingers, but smaller, webbed to the discs; outer metatarsals separated nearly to the base; sub-articular tubercles rather small, very prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{1}{2}$ the length of the inner toe; a very indistinct outer tubercle.

Skin smooth above, with a rather indistinct glandular fold above the tympanum; a glandular fold from below the eye to the shoulder, followed by a glandule. Belly and posterior half of lower surface of thighs granulate.

Light greyish brown above, with round dark spots; a darker band on the side of the head and body; limbs with indistinct dark cross-bands. Lower parts white, hind limbs specked with greyish brown.

Male unknown.

Measurements of type specimens (♀).

From snout to vent	..	..	..	87 millim.
Head	..	..	..	29
Width of head	..	..	..	29
Snout	..	..	..	12
Eye	..	..	..	10
Interorbital width	..	..	..	7
Tympanum	..	..	..	8
Fore limb	..	..	..	54
First finger	..	..	..	12
Second finger	..	..	..	12
Third finger	..	..	..	19
Fourth finger	..	..	..	11
Hind limb	..	..	..	146
Tibia	..	..	..	48
Foot	..	..	..	45
Third toe	..	..	..	23
Fourth toe	..	..	..	38
Fifth toe	..	..	..	28

Habitat. Luzon, Philippines. Recorded by Mocquard from Mt. Kina Baloo, North Borneo.

The type specimen, from Zamboanga, is the only one known to me, the specimens from Celebes, which I had referred to this species, being now regarded as inseparable from *R. chalconota*.

117. *Rana ishikawa*.

Buergeria ishikawa, Stejneger. *Proc. Biol. Soc. Washingt.* XIV, 1901, p. 190.

Rana ishikawa, Stejneger. *Herp. Fa.* p. 132, fig. (1907).

Vomerine teeth in short series behind the level of the choanae.

Head as long as broad, much depressed; snout blunt, vertically truncate at the end, as long as the eye; canthus rostralis well marked; loreal region feebly oblique, concave; nostril nearer the tip of the snout than the eye; interorbital region slightly broader than the upper eyelid; tympanum very distinct, $\frac{1}{2}$ the diameter of the eye and scarcely more than its distance from the latter.

Fingers moderately long, with rather large discs about $\frac{3}{4}$ the diameter of the eye, first longer than the second.

Tibio-tarsal articulation reaching between eye and tip of snout; heels slightly overlapping; tibia $2\frac{1}{2}$ times in length from snout to vent. Toes about $\frac{3}{4}$ webbed, the discs a little smaller than those of the fingers; subarticular tubercles small, prominent; a tarsal fold; inner metatarsal tubercle flat, less than $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin of upper surface exceedingly rough, even on the upper eyelids and on the sides of the head, the large tubercles wrinkled radially from a central prominence and surrounded concentrically by smaller tubercles. Lower surface finely granulate, except the posterior side of the thigh, which is coarsely so.

Brownish above, with a network of chocolate brown surrounding the large insular tubercles, which are ochraceous-buff, with the central prominence darker brown; lips pale, blotched with dark brown; limbs cross-barred with dark brown and drab. Pale russet beneath, with a network of obscure whitish mottlings.

From snout to vent 115 millim.

Habitat. Loo Choo Islands (Okinawa Shima).

The single specimen is preserved in the Imperial Museum, Tokyo.

118. *Rana crassiovis*, sp. n.

Vomerine teeth in short oblique series between the choanae, a little nearer to each other than to the latter.

Head as long as broad, much depressed; snout rounded, feebly projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis distinct; loreal region feebly oblique, very-concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width or that of the upper eyelid; tympanum very distinct, about $\frac{3}{4}$ the diameter of the eye, $2\frac{1}{2}$ times its distance from the latter.

Fingers long and slender, with a slight dermal border, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, as long as broad and measuring $\frac{3}{4}$ the diameter of the tympanum; first finger as long as the second, third much longer than the snout; subarticular tubercles rather large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia $5\frac{1}{2}$ to 6 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent, $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, coarsely granulate on the sides, smooth beneath; a short glandular fold above the tympanum.

Dark purplish brown above, with large darker spots or marblings, yellowish on the sides, with round black spots; hind limb with numerous, very regular dark cross-bands; hinder side of thighs blackish brown, with white vertical bars, continuation of the interspaces between the dark cross-bands of the upper surface. White beneath, throat and breast speckled or spotted with brown.

Male unknown.

Eggs very large and unpigmented, 3 millim. in diameter.

Measurements of the types (♀), in millimetres.

From snout to vent	..	..	..	63	62
Head	..	..	..	23	21
Width of head	..	..	..	23	21
Snout	..	..	..	8	8
Eye	..	..	..	8	7
Interorbital width	..	..	..	5	5
Tympanum	..	..	..	5	4
Fore limb	..	..	..	44	46
First finger	..	..	..	10	9
Second finger	..	..	..	10	9
Third finger	..	..	..	15	14
Fourth finger	..	..	..	9	9
Hind limb	..	..	..	127	124
Tibia	..	..	..	42	40
Foot	..	..	..	37	33
Third toe	..	..	..	20	19
Fourth toe	..	..	..	31	28
Fifth toe	..	..	..	22	21

Habitat. Korinchi, Sumatra, 4,000 feet. The two specimens were obtained by the Robinson-Kloss Expedition¹ on the Batrachians of which I prepared a report 6 years ago still unpublished.

This species appears to be most nearly related to *R. pantherina*, van Kampen, likewise from Sumatra, which differs in having a larger tympanum, the interorbital space narrower than the upper eyelid, the first finger shorter than the second, and the belly granulate.

119. *Rana kampeni*, n. n.

Rana pantherina (non Fitz.), van Kampen, *Nat. Tijdschr. Nederl. Ind.* L.XIX, 1910, p. 22, pl. i, fig. 2.

Vomerine teeth in short oblique series extending somewhat beyond the level of the posterior borders of the choanae.

Head as long as broad; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis strong; loreal region feebly oblique, deeply concave; nostril equally distant from the eye and from the tip of the snout; interorbital

¹ [Since Dr. Boulenger returned the final proof of this memoir his paper on the Batrachia and Reptiles of the Robinson-Kloss Expedition has been published. The reference, which has priority over the description given here, is *Fourn. Fed. Malay States Mus.* VIII (2), 292 (1920). N. A.]

space narrower than the upper eyelid ; tympanum very distinct, about $\frac{3}{4}$ the size of the eye.

Fingers moderately long, the tips dilated into large discs, about as long as broad and $\frac{3}{4}$ the diameter of the tympanum ; first finger shorter than the second, third longer than the snout.

Hind limb very long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout ; tibia 6 times as long as broad, $1\frac{1}{2}$ times in length from snout to vent, much longer than the foot. Toes with well developed discs smaller than those of the fingers, nearly entirely webbed ; outer metatarsals separated nearly to the base ; inner metatarsal tubercle small ; no outer tubercle.

Skin smooth, belly granulate.

Bluish grey above, with large bluish black spots with light centres ; limbs with dark cross-bands ; white beneath.

From snout to vent 36 millim.

Habitat. Deli, Sumatra.

120. *Rana livida*.

? *Polypedates smaragdinus*, Blyth, *Journ. As. Soc. Beng.* XXI, 1852, p. 355.

Polypedates lividus, Blyth, *Journ. As. Soc. Beng.* XXIV, 1855, p. 718.

Polypedates smaragdinus, Jerd. *Proc. As. Soc. Beng.* 1870, p. 83.

Polypedates chloronotus, Günth. *Proc. Zool. Soc.* 1875, p. 569, pl. lxx, fig. A.

Rana chloronata, Bouleng. *Cat. Batr. Ecaud.* p. 69 (1882).

Rana livida, Bouleng. *Ann. Mus. Genova* (2) V, 1887, p. 484, and *Faun. Brit. Ind., Rept.* p. 462 (1890) ; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 201 ; Bouleng. *Faun. Mal. Pen., Rept.* p. 245 (1912).

- Vomerine teeth in straight or oblique series between or extending a little beyond the choanae, equally distant from each other or nearer the latter.

Head as long as broad or slightly broader than long, much depressed ; snout rounded, feebly projecting beyond the mouth, as long as or slightly longer or slightly shorter than the eye ; canthus rostralis obtuse ; loreal region very feebly oblique or nearly vertical, deeply concave ; nostril a little nearer the tip of the snout than the eye ; distance between the nostrils equal to the width of the interorbital region or to that of the upper eyelid ; tympanum very distinct, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye, 1 to 4 times its distance from the latter.

Fingers moderate, depressed, with more or less distinct dermal border, the tips dilated into very large discs, as long as broad, as large as or a little smaller than the tympanum, with a groove separating the upper from the lower surface ; first finger as long as or a little longer than the second, third longer than the snout ; subarticular tubercles large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia 4 to 5 times as long as broad, $1\frac{1}{3}$ to $1\frac{1}{2}$ times in length of head and body,

shorter than the fore limb, longer than the foot. Toes with discs similar to those of the fingers, but smaller, feebly webbed, the web feebly notched and involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, flat, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; no outer tubercle.

Skin smooth, flanks and back of thighs granulate; a glandular fold from below the eye to the shoulder, followed by a glandule.

Upper surface of head and body green, with or without a few black spots, sides of head and body dark brown; a white streak along the upper lip; limbs with blackish cross-bands; groin and back of thighs with yellow spots or marblings. Lower parts white or yellowish, throat and breast usually brown or speckled with brown.

Males with an external vocal sac on each side of the throat, in front of the arm; fore limb strong; a thick pad on the inner side of the first finger, covered during the breeding season, with a yellowish velvety horny layer.

Nasal bones small, widely separated from each other; ethmoid exposed above and truncate or rounded in front. Terminal phalanges T-shaped.

Tadpoles from Tenasserim, referred with doubt to this species, and badly preserved as regards the labial teeth, are provided with a ventral sucking-disc, and are peculiar in having a round black spot on each side behind the eye and another on each side of the belly, near the base of the tail.

Eggs 2 millimetres in diameter, not pigmented.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
	♂	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀
From snout to vent	.. 51	51	50	50	49	45	95	93	90	84	100	90
Head ..	.. 18	18	18	18	17	16	29	28	29	28	32	31
Width of head ..	.. 18	18	18	18	17	16	29	30	29	29	33	31
Snout ..	.. 7	7	6	6	6	6	10	10	10	10	13	11
Eye ..	.. 7	7	7	7	7	6	10	10	10	10	11	10
Interorbital width	.. 3	3	3	3	3	3	6	6	6	6	7	6
Tympanum ..	.. 4	4	4	4	4.5	4	5	5	5	5	6	5
Fore limb ..	.. 35	35	35	34	33	32	60	63	58	58	65	60
First finger ..	.. 8	7	7	7	7	6	12	14	12	12	15	13
Second finger ..	.. 7	6	6	6.5	6.5	6	11	13	11	11	13	13
Third finger ..	.. 11	10	10	10	10	9	18	18	17	17	20	18
Fourth finger ..	.. 7	7	7	7	7	6	12	13	11	12	14	12
Hind limb ..	.. 95	93	90	90	88	87	170	170	164	160	180	174
Tibia ..	.. 32	31	30	30	29	28	57	58	55	52	62	58
Foot ..	.. 29	28	27	27	26	26	52	52	50	50	53	51
Third toe ..	.. 15	15	14	15	14	14	26	28	28	27	31	30
Fourth toe ..	.. 24	23	23	23	22	21	42	44	43	41	45	41
Fifth toe ..	.. 20	18	17	17	17	17	34	34	33	34	36	33

1-10. Darjiling (types of *P. chloronotus*). 11-12. Thagata, Tenasserim.

Habitat. Eastern Himalayas, hills of Assam, Tenasserim, and Perak.

This handsome frog links the species grouped round *R. chalconota* with *R. latopalmata* and its allies, and speaks against Cope's

genus *Amolops*, which one might otherwise feel justified to accept, at least as a subgenus.

121. *Rana ricketti*.

Rana ricketti, Bouleng. *Proc. Zool. Soc.* 1899, p. 168, pl. xix, fig. 2.

Vomerine teeth in small groups close together behind the level of the choanae.

Head as long as broad or a little broader than long, very strongly depressed; snout rounded, projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region nearly vertical, concave; nostril equally distant from the eye and from the end of the snout; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum more or less distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye, $\frac{1}{2}$ to once its distance from the latter.

Fingers rather short, flattened, with distinct dermal border, ending in large round discs, at least as large as the tympanum, with a groove separating the upper from the lower surface and another above corresponding to the long transverse limb of the terminal phalanx; first finger shorter than the second, third much longer than the snout; subarticular tubercles rather small, feebly prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or not quite so far, the heels overlapping when the limbs are folded at right angles to the body; tibia $3\frac{1}{2}$ to 4 times as long as broad, $1\frac{1}{2}$ to 2 times in length from snout to vent, a little shorter than the fore limb, a little longer than the foot. Toes with large discs similar to those of the fingers but a little smaller, completely webbed, the web involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle oval, flat, $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth above or finely shagreened and with scattered small flat warts; a glandular fold above the tympanum; belly more or less distinctly granulate.

Olive above, with large dark spots or marblings; a dark streak on each side of the head, passing through the eye; limbs with regular dark cross-bands. Whitish beneath, throat, or throat and breast, spotted or marbled with brown.

Males without vocal sacs; a large pad on the inner side of the first finger, covered with large round yellowish horny granules.

Nasals very small, widely separated from each other and from the ethmoid, which is exposed above and rounded in front. Terminal phalanges T-shaped, with very long transverse limb.

Measurements, in millimetres.

	1.	2.	3.	4.	5.
	♀	♀	♂	♀	♀
From snout to vent ..	38	32	46	55	54
Head ..	14	12	15	17	17
Width of head ..	14	12	16	19	18
Snout ..	4	3.5	5	5.5	5.5
Eye ..	4.5	4	5.5	7	7
Interorbital width ..	3	2.5	4	4	3.5
Tympanum ..	2	1.5	1.5	2	2
Fore limb ..	22	18	28	32	30
First finger ..	4.5	3.5	4.5	5.5	5.5
Second finger ..	5	4	6	7	6.5
Third finger ..	6.5	5.5	8.5	10	9
Fourth finger ..	4.5	3.5	5.5	7	6
Hind limb ..	61	50	76	88	86
Tibia ..	20	16	25	29	28
Foot ..	17	14	23	26	24
Third toe ..	10	8	12	16	15
Fourth toe ..	14	12	19	22	20
Fifth toe ..	12	9	15	18	16

1-2. Kuantun (types). 3-5. Man Son Mts.

Habitat. Kuantun Mountains in the N.-W. of the Chinese Province of Fokien (3,000-4,000 feet), and Man Son Mountains, Tonkin (3,000-4,000 ft.), near the Chinese Province of Kwangsi.

121. *Rana latopalmata*.

Polypedates? marmoratus, Blyth, *Journ. As. Soc. Beng.* XXIV, 1858, p. 188; Anders. *Proc. Zool. Soc.* 1871, p. 209; Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 108; Anders. *Anat. Zool. Res. Yunn.* p. 842 (1879).

Polypedates afghana, Günth. *Cat. Batr. Sal.* p. 81 (1858), and *Rept. Brit. Ind.* p. 432 (1864).

Amolops afghanus, Copc, *Nat. Hist. Rev.* 1865, p. 117.

? *Ixalus kakhienensis*, Anders. *Anat. Zool. Res. Yunn.* p. 845, pl. lxxviii, fig. 6.

Rana afghana, Bouleng. *Cat. Batr. Ecaud.* p. 69 (1882), and *Ann. Mus. Genova*, (2) V, 1887, p. 420; Annand. *Rec. Ind. Mus.* VIII, 1912, p. 24, pl. iv, fig. 3.

Rana latopalmata, Bouleng. *Cat.* p. 464, *Faun. Ind., Rept.* p. 462 (1890), *Ann. Mus. Genova* (2) XIII, 1893, p. 337, and *Proc. Zool. Soc.* 1893, p. 526, pl. xliii, fig. 3.

Ixalus argus, Annand. *Rec. Ind. Mus.* VIII, 1912, p. 16, pl. iii, fig. 3.

Vomerine teeth in short transverse or feebly oblique series or small groups between the choanae or just behind the level of their posterior borders, nearer to each other than to the latter.

Head as long as broad or a little broader than long, much depressed; snout rounded or truncate, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril equally distant from the eye and from the tip of the snout, or a little nearer the latter; distance between the nostrils equal to or a little greater than the width of the interorbital space, which is equal to or a little less than that of the upper eyelid; tympanum more or less distinct, sometimes covered with granulations, $\frac{1}{2}$ to $\frac{3}{4}$ the diameter of the eye, $\frac{1}{2}$ to $1\frac{1}{2}$ times its distance from the latter.

Fingers moderately long, depressed, with distinct dermal border, with very large discs, broader than long and much larger than the tympanum, bearing a groove separating the upper from the lower surface and another above, corresponding to the long transverse limb of the terminal phalanx; first finger as long as or shorter than the second, third $1\frac{1}{2}$ to $1\frac{1}{4}$ times as long as the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $5\frac{1}{2}$ times as long as broad, $1\frac{3}{4}$ to $1\frac{1}{2}$ times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with large discs similar to those of the fingers but considerably smaller, completely webbed, the web feebly notched and involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles moderately large or rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, flat, $\frac{1}{2}$ to $\frac{1}{3}$ the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, sides sometimes with rather large warts; a glandular fold above the tympanum. Belly and posterior half of lower surface of thighs more or less granulate.

Brown or dark olive above, spotted or marbled with blackish, or with greyish variegations; limbs with dark cross-bands. Yellowish beneath, uniform or marbled with brown.

Males with an external vocal sac on each side of the throat, in front of the arm; fore limb strong, with a large pad on the inner side of the first finger, covered during the breeding season with a velvety greyish horny layer.

Nasal bones small and widely separated from each other and from the ethmoid, which is truncate or rounded in front. Terminal phalanges T-shaped, the transverse limb longer than the longitudinal.

Tadpole with a large ventral sucking-disc, truncate in front, free on the sides and behind. Tail about $1\frac{1}{2}$ times the length of the body, pointed, the dorsal crest commencing at a short distance from the body. Beak strong, black; lip much developed, not fringed, with 8 upper (3 uninterrupted) and 3 lower (2 uninterrupted) series of horny teeth.

Eggs $1\frac{1}{2}$ to 2 millim. in diameter, not pigmented.

Measurements, in millimetres.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀
From snout to vent	90	77	60	46	100	91	90	90	84	83	80	75	82	54	52	82
Head	31	27	22	18	32	29	30	30	28	29	27	26	27	18	18	27
Width of head	33	27	22	18	35	33	32	33	30	32	29	28	30	18	18	29
Snout	10	9	8	6	12	11	10	10	10	10	9	9	10	7	7	10
Eye	10	9	8	6	12	10	10	10	10	10	9	9	10	7	7	10
Interorbital width	6	5.5	4	4	7	8	7	7	7	7	6	6	6	4	4	6
Tympanum	3	3	3	2	4	4	3.5	3	3.5	3.5	3	3	3	3	3	3
Fore limb	61	50	42	33	64	64	59	60	57	61	54	53	55	35	34	52
First finger	11	10	7	7	13	13	12	12	11	14	11	12	12	7	6	5

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	♂	♂	♂	♂	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀	♀
Second finger ...	13	10	8	7	14	13	13	12	14	12	12	13	8	7	10	
Third finger ..	16	13	12	10	19	19	18	17	18	16	17	17	11	10	15	
Fourth finger ..	12	9	7	6	13	13	12	12	12	12	11	11	7	6	10	
Hind limb ..	162	135	108	89	170	168	163	160	154	158	146	145	144	90	94	143
Tibia ..	55	47	36	29	58	57	55	53	51	53	50	50	49	30	33	48
Foot ..	49	39	30	25	52	50	49	49	43	48	40	40	41	26	27	41
Third toe ..	27	24	16	14	28	29	26	27	25	28	25	23	24	16	16	24
Fourth toe ..	41	33	25	22	43	42	41	40	38	40	36	35	35	22	23	35
Fifth toe ..	33	28	19	17	35	32	33	32	30	32	28	28	28	18	18	29

1-10. Darjiling. 11-12. Putao plain, N. Burma. 13-14. Thayetmyo. 15. Tenasserim (type). 16. —? (type of *Polypedates afghana*).

Habitat. Eastern Himalayas, between 1,000 and 6,000 feet, Khasi hills, Southern Yunnan and hills of Burma as far south as Tenasserim.

123. *Rana himalayana*.

Rana himalayana, Bouleng. *Ann. and Mag. N.H.* (6) 11, 1888, p. 507, and *Faun. Ind., Rept.* p. 463 (1890).

Vomerine teeth in short oblique groups between or just behind the choanae, which are unusually small, nearer to each other than to the latter.

Head a little broader than long, much depressed; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril a little nearer the eye than the end of the snout; distance between the nostrils a little greater than the width of the inter-orbital space, which equals that of the upper eyelid; tympanum very indistinct, $\frac{1}{4}$ to $\frac{1}{3}$ the diameter of the eye, $\frac{2}{3}$ to once its distance from the latter.

Fingers very long, with very large discs, broader than long, bearing a groove separating the upper from the lower surface and another above, corresponding to the long transverse limb of the terminal phalanx; first finger shorter than the second, the tip merely swollen, third $2\frac{1}{3}$ to $2\frac{1}{2}$ times as long as the snout; sub-articular tubercles moderate.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to $4\frac{1}{2}$ times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with large discs similar to those of the fingers but considerably smaller, completely webbed, the web feebly notched and involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval or elliptic, flat, $\frac{1}{4}$ to $\frac{3}{8}$ the length of the inner toe; no outer tubercle.

Skin smooth above, with small granules on the sides and temples; a more or less distinct glandular fold above the tympanum. Belly and posterior half of lower surface of thighs granulate.

Olive or greyish above, with rather indistinct large, round, darker spots on the body and cross-bands on the limbs; hinder

125. *Rana hainanensis*.

Staurois hainanensis, Bouleng. *Proc. Zool. Soc.* 1899, p. 958, pl. lxvii, fig. 2; T. Vogt, *Sitzb. Ges. Nat. Fr. Berl.* 1913, p. 225.

Vomerine teeth absent. A feeble tooth-like bony process in front of the lower jaw.

Head a little broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region feebly oblique, deeply concave; nostril equally distant from the eye and from the end of the snout; distance between the nostrils greater than the interorbital width, which equals that of the upper eyelid; tympanum distinct, $\frac{1}{3}$ to $\frac{2}{3}$ the diameter of the eye, $\frac{1}{3}$ to once its distance from the latter.

Fingers rather slender, with a distinct dermal border, the tips dilated into very large discs which are a little broader than long, much larger than the tympanum, with a groove separating the upper from the lower surface and another above, corresponding to the long transverse limb of the terminal phalanx; first finger shorter than the second, third twice as long as the snout; subarticular tubercles rather small, feebly prominent.

Hind limb long, tibio-tarsal articulation reaching the tip of the snout or slightly beyond, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, $1\frac{1}{2}$ to $1\frac{3}{4}$ times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with large discs similar to those of the fingers but smaller, completely webbed, the web involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle flat, scarcely distinct, about $\frac{1}{2}$ the length of the inner toe; no outer tubercle.

Skin smooth above in the adult, warty in the young; a glandular fold above the tympanum; lower parts smooth.

Olive above, spotted with black, or black with pale olive markings; limbs with dark cross-bands; hinder side of thighs with a black reticulation. Lower parts white.

Male unknown.

Tadpole with a large ventral adhesive disc, free on the borders, truncate in front. Tail pointed, twice as long as the body, the dorsal crest not extending to the base of the muscular part. Beak black, with feebly denticulate edge; lip large, with 3 uninterrupted upper and 2 pairs of lower series of horny teeth in front and 2 uninterrupted and 1 narrowly interrupted series behind.

Measurements, in millimetres.

From snout to vent	..	..	..	58 millim.
Head ..	..	..	..	19
Width of head ..	..	..	..	21
Snout ..	..	..	..	6
Eye ..	..	..	..	7
Interorbital width ..	..	..	..	5
Tympanum ..	..	..	..	2.5

Fore limb	..	..	..	..	37 millim.
First finger	..	..	..	..	7
Second finger	..	..	..	..	9
Third finger	13
Fourth finger	8
Hind limb	94
Tibia	32
Foot	27
Third toe..	15
Fourth toe	22
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Habitat. Hainan.

Although deprived of vomerine teeth, this frog is too closely related to *R. latopalmata* to be generically separated from it, but it connects *Rana* with *Staurois*, to which genus it was originally referred.

INDEX TO THE SUBGENERA, SPECIES AND VARIETIES OF THE
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RECORDS
of the
INDIAN MUSEUM

Vol. XXI.

CATALOGUE OF THE PLANORBIDAE
IN THE
INDIAN MUSEUM (NATURAL HISTORY), CALCUTTA.

By
LOUIS GERMAIN.

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PRÉFACE.

En 1912 M. le DR. N. ANNANDALE, anciennement Superintendant de l'Indian Museum (Natural History) et aujourd'hui Directeur (Zoological Survey of India), a eu l'amabilité de me confier les *Planorbidae* du Musée qu'il dirige, à Calcutta, avec une si brillante activité. Des travaux en cours d'exécution ne m'avaient pas encore permis de terminer l'étude de ces matériaux quand sont survenus les douloureux événements d'Août 1914. J'ai repris et terminé ce Mémoire en 1916 : les difficultés et les risques des communications entre la France et l'Inde sont les uniques causes du retard apporté à sa publication.

La collection des PLANORBIDAE du Musée d'Histoire naturelle de Calcutta comprend une centaine d'espèces réparties dans les genres *Planorbis*, *Segmentina*, *Planorbula*, *Pompholyx*, *Carinifex* et *Choanomphalus*. C'est dire qu'elle est relativement riche, surtout en espèces du genre *Segmentina* (11 espèces) et du sous-genre *Gyraululus* (41 espèces).

Parmi ces matériaux, dont l'origine est fort diverse, il en est dont l'intérêt est considérable. Nous signalons notamment : les importants documents réunis par le DR. F. STOLICZKA pendant la seconde Mission anglaise au Yarkand et sommairement étudiés par G. NEVILL;¹ les *cotypes* des nombreuses espèces (*Planorbis* et *Segmentina*) de l'Inde et de l'Asie orientale si incomplètement décrites par W. H. BENSON; les belles séries recueillies, dans le nord de l'Inde, par le DR. N. ANNANDALE; les espèces et variétés litigieuses ou peu connues quelquefois représentées par de nombreux individus.

Ce sont surtout ces documents qui font l'objet de ce travail ainsi devenu bien plus une étude—parfois même un peu détaillée—qu'un simple Catalogue.² Tel qu'il est, je pense qu'il rendra quelques services aux travailleurs qui s'intéressent aux Mollusques d'eau douce.

Je ne saurais terminer cette courte introduction sans adresser mes remerciements bien sincères à M. le DR. N. ANNANDALE pour son inépuisable complaisance et la libéralité avec laquelle il m'a ouvert les *Records of the Indian Museum of Calcutta*.

Angers, Août 1918.

¹ NEVILL (G.), *Scientific Results of the Second Yarkand Mission, Mollusca*, Calcutta, 1878, in 4°.

² J'ai pris soin d'indiquer la synonymie exacte des *Planorbis* signalés par G. NEVILL dans son excellent Catalogue des Mollusques du Musée de Calcutta [*A Handlist of Mollusca in the Indian Museum Calcutta, Part I. Gastropoda, Pulmonata and Prosobranchia-Neurobranchia*, Calcutta, 1878. *Planorbis*: pp. 241—247].

CATALOGUE OF THE PLANORBIDAE IN THE INDIAN MUSEUM (NATURAL HISTORY), CALCUTTA.

By LOUIS GERMAIN.

Famille des PLANORBIDAE.

Sous-Famille des PLANORBINAE.

Genre *Planorbis* (Guettard) Müller, 1774.

1702. *Planorbis* PETIVER, *Gazophylacii Naturae et Artis Decades*, etc., London, p. 16, tab. X, fig. 11 [espèce figurée: *Helix planorbis* LINNÉ, *Fauna Sueciae*, 1761, p. 527].
1756. *Planorbis* GUETTARD, *Mém. Académie Sciences*, p. 151 [espèce citée: *Planorbis brunneus* LISTER, *Animal. Angl.*, p. 143, pl. ii, fig. 26, non *Planorbis brunneus* Gray (= *Helix cornea* LINNÉ)].
1757. *Coretus* ADANSON, *Hist. natur. Sénégal, Coquillages*, Paris, p. 7.
1758. *Helix* (part) LINNÉ, *Systema Naturae*, Ed. X, I, p. 768.
1767. *Planorbis* GEOFFROY, *Traité Coquilles fluv. terr. Paris*, Paris, p. 12 et p. 81 [= *Planorbis* + *Physa*].
1767. *Planorbis* GEOFFROY, *loc. supra cit.*, traduction allemande par MARTINI, Nürnberg, p. 10 et p. 75 [= *Planorbis* + *Physa*].
1774. *Planorbis* MÜLLER, *Vermium terrest. et fluv. Histor.*, II, p. 152 [= *Planorbis* + *Physa*].
1775. *Planorbis* MÜLLER, *Zoologiae Danicae prodromus*, etc., Havniae, p. XXX et p. 238.
1776. *Orbis* SCHRÖTER, *Journal für die Liebhaber des Steinreichs u. d. Conchyl.* III, Weimar, p. 10 (erreur typogr. pro *Planorbis* d'Argenville).
1786. *Nautilus* LIGHTFOOT, *An Account of some minute British Shells*, etc., *Philosoph. Transact.*, LXXVI, p. 163.
1789. *Planorbis* BRUGUIÈRES, *Encyclopédie méthod.*, Vers, Paris, I, p. XVI (nomen nudum).
1797. *Vortex* ANONYME, in: *Museum Calonianum*, p. 58 (type cité: *Helix cornea* Linné) [non *Vortex* OKEN, 1815].
1898. *Planorbis* BOLTEN, *Museum Boltenianum*, p. 51 [fide W. H. DALL, *An Index to the Museum Boltenianum, Smithsonian Institution*, Publ. No. 2360, Washington, 1915, p. 47].
1799. *Planorbis* DE LAMARCK, *Prodrome système animaux sans vertèbres*, *Bulletin Société hist. natur. Paris*, p. 76.
1801. *Planorbis* DE LAMARCK, *Essai système animaux sans vertèbres*, Paris, p. 93.
1801. *Planorbis* DRAPARNAUD, *Tableau Mollusques terr. fluv. France*, Montpellier, p. 30 et p. 42.
1806. *Planorbis* CUVIER, *Mémoire sur le Limnée et le Planorbe*, *Ann. les Mustum Paris*, VII, p. 185.
1806. *Planorbarius* DUMÉRII, *Zoologie analytique*, etc., Paris, p. 164.
1810. *Planorbis* DE MONTFORT, *Conchyliologie systématique*, Paris, II, p. 270 [type: *Planorbis corneus* Linné].
1817. *Planorbis* SCHUMACHER, *Essai nouveau système habitat. vers testacés*, Copenhagen, p. 255.

1817. *Cornu* SCHUMACHER, Essai nouveau système habitat. vers testacés, Copenhague, p. 255 [non BORN, 1778].
1820. *Anisus* STUDER, *Kurzes Verzeichniss... Vaterl. Conchyl.*, p. 23 [= *Planorbis* + *Physa*].
1833. *Anisus* FITZINGER, *Systemat. Verzeichniss d. im Erzherzogthum Esterr. vorkomm. Weichthiere*, p. 11 [non *Anisus* DUJARDIN, 1821; non *Anisus* GRAY, 1847].
1855. *Planorbis* MOQUIN-TANDON, *Hist. Mollusques terr. fluvi. France*, II, p. 421.
1865. *Planorbis* BINNEY, *Land and Freshwater Shells, North America*, II, p. 103.
1870. *Planorbis* DALL, *Annals of Lyceum of Natur. History of New York*, IX, p. 341.
1878. *Planorbis* SOWERBY, Monograph of the Genus *Planorbis*, in L. REEVE, *Conchologia Iconica*, Vol. XX, London.
1886. *Planorbis* CLESSIN, Die Familie der Limnaeiden, in: MARTINI et CHERNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., Vol. XVII, Nürnberg.

Les Planorbes sont des animaux connus depuis fort longtemps. Les anciens naturalistes ont, en effet, figuré quelques unes des espèces européennes et notamment la plus grande, le *Planorbis* (*Planorbis*) *corneus* Linné, dont nous trouvons l'iconographie dans les ouvrages célèbres de M. LISTER¹ et de N. GUALTIERI.²

C'est J. PETIVER³ qui le premier, in 1702, introduit le nom de *Planorbis* dans la nomenclature en figurant, sous ce nom, l'*Helix planorbis* de C. LINNÉ.⁴ Plus tard en 1756, GUETTARD en reprenant ce vocable de *Planorbis*, définit très heureusement le genre et distingue trois espèces. Etant donné l'importance de la note de GUETTARD, je reproduis ce qui a trait aux Planorbes :

“ CARACTÈRE VI.

“ Du *Planorbis*.

“ La tête se contracte, ne garde pas de forme constante. Les cornes sont coniques, au nombre de deux, placées chacune à côté de la tête, elles se contractent; les yeux sont en pareil nombre, posés intérieurement à la base des cornes, et ne sont qu'un petit point noir. L'ouïe est un trou latéral, antérieur, et à droite, la base du corps sert de pied; la coquille est spirale, aplatie; l'opercule manque; le corps est glanduleux, noir, brun, gris, roussâtre ou de la couleur de la coquille.

“ 1. *Planorbis* brun, strié circulairement, à quatre pas de spirale.

“ *Cochlea pulla, ex utraque parte circa umbilicum cava*. List. Hist. Animal. Angl., p. 143, tit. XXVI.

¹ LISTER (M.), *Historia Conchyliorum*, Londoni, 1685, tab. CXXXVII, fig. 41.

² GUALTIERI (N.), *Index Testaceorum Conchyliorum quae adservantur in Museo N. Gualtieri*, Florentiae, 1742, tab. IV, fig. DD (*Planorbis corneus* Linné), EE (*Planorbis carinatus* Müller), FF et GG. (*Planorbis vortex* Linné). N. GUALTIERI désigne les Planorbes sous le titre général de *Cochlea fluviatilis depressa*.

³ PETIVER (J.), *Gazophylactii Naturae et Artis Decades*, etc., London, 1702, p. 16.

⁴ LINNÉ (C.), *Fauna Suecicae*, Stockholmiae, 1751, p. 521. C'est le *Planorbis* (*Tropidiscus*) *planorbis* Linné.

" 2. Planorbe gris, plus aplati d'un côté, à quatre pas de spirale.

" *Cochlea fusca, altera parte planior, et limbo insignita, quatuor spirarum.* List. Hist. Animal. Angl., p. 145, tit. XXVII.

" 3. Planorbis rousseâtre, plus aplati d'un côté, à cinq pas de spirale.

" *Cochlea exigua subfusca, altera parte planior, sine limbo, quinque spirarum.* List. Hist. Animal. Angl., p. 145, tit. XXVIII.

" Lieu. On les trouve dans les rivières, les ruisseaux, les mares, étangs et bassins d'eau."¹

Ainsi, dès 1756, GUETTARD a exactement délimité le genre *Planorbis* comme le font encore les malacologistes actuels.

Onze années plus tard (1767), dans son élégant "Traité sommaire des Coquilles tant terrestres que fluviatiles qui vivent aux environs de Paris." GEOFFROY donne, en français et en latin, une nouvelle définition des Planorbes :

" Le Planorbe—*Planorbis*.

" 2 tentacules filiformes.

" Yeux placés à la base des tentacules du côté intérieur.

" Coquille univalve en spirale et ordinairement aplatie."²

La diagnose de GEOFFROY est moins parfaite que celle de GUETTARD, car elle s'applique, non seulement aux Planorbes, mais encore aux Physes que le malacologiste parisien désigne sous le nom de Bulles (*Bulla*).

La même conception du genre qui nous occupe est admise par O. F. MÜLLER,³ le premier auteur qui employa le terme *Planorbis* dans un ouvrage où la nomenclature binominale est rigoureusement appliquée. C'est pour cette raison que W. H. DALL⁴ lui attribue la paternité du genre. Il me semble cependant plus rationnel et plus juste de considérer GUETTARD comme le créateur du genre *Planorbis* car il eut le mérite d'en donner, le premier, une définition exacte.⁵

J. B. M. DE LAMARCK, en 1799⁶ et en 1801,⁷ adopte le genre *Planorbis*, mais considère comme type du genre le *Planorbis cornu arietis* [= *Cerastes cornu arietis* Linné⁸], espèce de l'Amérique du sud appartenant à la famille des AMPULLARIIDÆ. Dans son

¹ GUETTARD, Observations qui peuvent servir à former quelques caractères de Coquillages; *Mémoires Académie Royale sciences Paris*, 1756, pp. 151—152.

² GEOFFROY (M.), *Traité sommaire des Coquilles tant terrestres que fluviatiles qui vivent aux environs de Paris*, Paris, 1767, p. 12—13 (le même texte en latin), et p. 80.

³ MÜLLER (O. F.), *Vermium terrestrium et fluviatilium Historiae*, etc., Lipsiae, II, 1774, p. 152.

⁴ DALL (W. H.), *Land and freshwater Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New-York, 1905, p. 83.

⁵ Bien plus exacte que celle de ses successeurs immédiats—et notamment O. F. MÜLLER—qui ont réuni les Planorbes et les Physes.

⁶ LAMARCK (J. B. M. DE), *Prodrome classification animaux sans vertèbres; Bulletin Société histoire naturelle Paris*, Paris, 1799, p. 76.

⁷ LAMARCK (J. B. M. DE), *Système des animaux sans vertèbres*, etc., Paris, 1801, p. 93.

⁸ LINNÉ (C.), *Systema Naturae*, Ed. X, Holmiae, 1758, p. 771, No. 590 (*Helix cornu arietis*), et Ed. XII, Holmiae, 1767, p. 1244, no. 674.

Histoire des *Animaux sans vertèbres*, J. B. M. DE LAMARCK cite encore, comme première espèce, le *Planorbis cornu arietis*, puis les vrais Planorbes connus de son temps.¹ Ce n'est que dans la seconde édition de ce célèbre ouvrage, publiée par G. P. DESHAYES en 1838,² que cette erreur est corrigée.

G. CUVIER, dans son Mémoire sur le Limnée et le Planorbe (1806) rapproche le Planorbe corné du *Limnaea stagnalis* et donne d'intéressants détails sur l'anatomie de cette espèce.³

Enfin, en 1810, DENYS DE MONTFORT⁴ délimite définitivement le genre—exactement comme l'avait fait GUETTARD dès 1756—en prenant pour type le *Planorbis corneus*, c'est-à-dire l'*Helix cornea* de LINNÉ.

Depuis cette époque, le genre *Planorbis* a généralement été adopté⁵ sauf cependant par de nombreux auteurs anglais: TH. PENNANT (1776),⁶ EM. MENDES DA COSTA (1778),⁷ G. WALKER et G. BOYS (1784),⁸ COMTE DE RAZOUMOWSKY (1789),⁹ G. MONTAGU (1803),¹⁰ W. G. MATON et J. RACKET (1807),¹¹ TH. BROWN (1818),¹² W. TURTON (1822),¹³ R. SHEPPARD (1825),¹⁴ etc. . . qui, à l'exemple de C. LINNÉ,¹⁵ ont classé les Planorbes dans le grand genre *Helix*. On trouvera, dans le tableau synonymique du genre, les indications concernant cette question. Signalons seulement encore le nom de *Anisus*, établi par STUDER en 1820,¹⁶ et qui est très exactement

¹ LAMARCK (J. B. M. DE), *Histoire naturelle des animaux sans vertèbres*, etc. . . VI, 2^e partie, Paris, Avril 1822, p. 151—155.

² LAMARCK (J. B. M. DE), *Histoire naturelle des animaux sans vertèbres*, etc. . . 2^e Edit. [par G. P. DESHAYES], VIII, Paris, 1838, p. 581, note 1.

³ CUVIER (G.), Mémoire sur le Limnée (*Helix stagnalis*) et le Planorbe (*Helix cornea* L.), *Annales Muséum Hist. natur.* Paris, VII, 1806, p. 185; et: *Mémoires pour servir à l'histoire et à l'anatomie des Mollusques*, Paris, 1817 (Mémoire No. XV, 14 pp. et 1 Pl.).

⁴ MONTFORT (DENYS DE), *Conchyliologie systématique*, II, Paris, 1810, p. 270.

⁵ J. R. DRAPARNAUD cite seulement le genre *Planorbis* mais sans nommer d'espèces dans son *Tableau des Mollusques terr. et fluv. de France*, 1801. En 1805 [*Histoire des Mollusques terr. et fluv. de France*, Paris, pp. 42-47] il adopte le genre *Planorbis* et décrit les espèces appartenant à la faune française.

⁶ PENNANT (TH.), *British Zoology, illustrated by plates and brief explanation*, London, 1776, in-4°, Vol. IV, p. 83.

⁷ COSTA (E. MENDES DA), *Historia naturalis Testaceorum Britanniae, or the British Conchology*, in 4°, London, 1778, p. 63.

⁸ WALKER (G.) et BOYS (GUL.), *Testacea minuta, rariora*, etc. . . [Texte rédigé par EDW. JACOB], London, 1784.

⁹ RAZOUMOWSKY (COMTE DE), *Histoire naturelle du Mont Jorat et de ses environs, et celle des trois lacs de Neuchâtel, Morat et Bienne*, Lausanne, 1789.

¹⁰ MONTAGU (G.), *Testacea Britannica, or Natural History of the British Shells, marine, land and fresh-water*, London, 1803.

¹¹ MATON (W. G.) et RACKET (J.), *A Descriptive Catalogue of the British Testacea*, London, 1807 (Extrait des: *Transact. Linnean Society*, VIII, 1807).

¹² BROWN (TH.), Account of the Irish Testacea (*Memoirs of the Wernerian Society*, III, 1818).

¹³ TURTON (W.), *Conchylia insularum Britannicarum; the Shells of the British Islands systematically arranged*, London, 1822.

¹⁴ SHEPPARD (R.), Description of seven new species of land and fresh-water shells, with observations upon many other species, including a list of such as have been found in the country of Suffolk (Extrait des: *Transactions Linnean Society*, XVI, London, 1825).

¹⁵ LINNÉ (C.), *Systema Naturae*, Ed. X, Holmiae, 1758, pp. 769—772; et Ed. XII, Holmiae, 1767, pp. 1243—1244; Ed. XIII [par J. F. GMBELIN], I, pars VI, Lipsiae, 1789, pp. 3623—3624.

¹⁶ STUDER (S.), *Kurzes Verzeichniss. . . Vaterl. Conchylien*, 1820, p. 23.

synonyme de *Planorbis* tel que le comprenait O. F. MÜLLER en 1774 [*Anisus* = *Planorbis* + *Physa*].

§.

Les *Planorbis* sont des animaux très répandus dans toutes les eaux douces du globe, sauf dans les contrées polaires ou subpolaires. Les espèces décrites jusqu'ici sont fort nombreuses et beaucoup sont à peine connues. L'anatomie n'a été faite que pour un nombre restreint d'espèces communes ce qui rend actuellement impossible toute classification basée sur l'organisation de ces Pulmonés.

L'étude du genre *Planorbis* est particulièrement difficile, beaucoup d'espèces étant fort voisines les unes des autres. Il n'existe, d'ailleurs, aucune bonne Monographie du genre. Des deux seules publiées l'une, celle de G. SOWERBY¹ est tout à fait incomplète et l'autre, celle de S. CLESSIN,² est malheureusement très défectueuse.³ Il serait cependant injuste de ne pas signaler des travaux beaucoup plus précis, renfermant d'excellents observations mais d'un caractère moins général. Il convient de citer, dans cet ordre d'idées, les très belles monographies de S. S. HALDEMAN⁴ et W. G. BINNEY⁵ sur les Limnaeidae de l'Amérique du Nord et le mémoire de C. A. WESTERLUND⁶ sur les Planorbes du système européen.

¹ SOWERBY (G. B.), Monograph of the genus *Planorbis*, in: L. REEVE, *Conchologia Iconica: or, illustrations of the Shells of Molluscos Animals*, London, in 4°-1878, 14 pl. (123 espèces décrites et figurées).

² CLESSIN (S.), Die Familie der Limnaeiden entholtend die genera *Planorbis*, *Limnaeus*, *Physa* und *Amphipeplea*, in: MARTINI (F. W. H.) et CHEMNITZ (J. H.), *Systematisches Conchylien-Cabinet*, Vol. XVII, Nürnberg. Les Planorbes occupent les pages 29 à 235 et 407—408 (Index aux pages. 427—430) et les planches V à XXXIII. Cette Monographie a été commencée par le Doct. W. DUNKER qui a publié les pages 32 à 65 (1856). Le reste du volume a été écrit par S. CLESSIN (y compris les pages 29 à 35 a et 36 a) et édité en un certain nombre de livraisons à des dates difficiles à préciser. Les pages 30—36 A sont comprises dans la livraison 270 des *Systematisches Conchylien-Cabinet* (1878). La livraison 319 (1882) renferme les pages 63—94 et les planches XI à XVII; la livraison 320 (1883), les pages 95—110 et les planches XVIII—XXII; les livraisons 328, 331 et 332 (1884), les pages 111 à 214 et les planches XXIII—XXVI; enfin les livraisons 334 et 336 (1885), les pages 214 à 235 et les planches XXVII à XXXIII. Dans la livraison 338 (1886) se trouve un supplément de deux pages consacré aux Planorbes (pp. 407—408) et l'Index alphabétique (pp. 427—430).

³ Les erreurs de détermination sont nombreuses; de plus les descriptions sont trop souvent incomplètes et peu exactes, les synonymies fautives et les indications de localités erronées.

⁴ HALDEMAN (S. S.), *Monograph of the Limnaeidae or Freshwater Univalve Shells of North America*, Philadelphia, 1841 à 1844, in 8, avec 35 pl. coloriées;—HALDEMAN (S. S.) et TRYON (W.), *Monograph of the Freshwater Univalve Mollusca of the United States*, Philadelphia, 1840—1871, 2 vol. in-8, avec planches.

⁵ BINNEY (W. G.), *Land and Fresh Water Shells of North America*, Part II, *Pulmonata limnophila and thalassophila*, Washington, Septembre 1865, IX + 161, pp., 261 figures sur bois dans le texte. [Les Planorbes occupent les pages 103—138 (fig. 174 à 229)]. Ce Mémoire forme le fascicule 143 (Vol. VII) des *Smithsonian Miscellaneous Collections*.

⁶ WESTERLUND (C. A.), *Malakologische Studien, Kritiken und Notizen*, X: *Conspicuum Specierum et Varietatum in Europa viventium generis Planorbis* Guett., *Malakozoolog. Blätter*, XXII, 1875, pp. 93—117, taf. II—III et IV.

§.

La division des *Planorbis* en sous-genres est extrêmement délicate, étant donné surtout l'absence de documents anatomiques.¹ La classification proposée par W. H. DALL en 1905² est certainement la meilleure. C'est elle que j'ai adoptée, après y avoir introduit quelques modifications qui m'ont paru indispensables.

Cette classification se résume ainsi :

Sous-Genre *PLANORBIS* sensu stricto.

Coquille grande ou assez grande, discoïde, ombiliquée en dessus et en dessous ; spire composée d'un petit nombre de tours ordinairement arrondis en dessus et en dessous.

Type : *Planorbis corneus* Linné.

Sous-Genre *PLANORBINA* Haldeman.³

Coquille rappelant celle des *Planorbis* sensu stricto, mais plus aplatie ; spire formée de tours plus nombreux et plus serrés, comprimés à la partie inférieure, ouverture très oblique.

Type : *Planorbis guadalupensis* Sowerby.

Sous-genre *PIEROSOMA* Dall, 1905.

Coquille de grande taille, relativement haute, plus profondément ombiliquée en dessus qu'en dessous ; spire formée de tours plus nombreux garnis de stries longitudinales fortes, les premiers carénés et aplatis en dessous ; ouverture grande, réfléchie, à bords plus ou moins épaissis.

Type : *Planorbis trivolvis* Say.

Sous-Genre *HELISOMA* Swainson, 1840.

Coquille de taille moyenne, relativement haute ; spire composée d'un petit nombre de tours à croissance très rapide, très carénés en dessus et en dessous ; ouverture campanulée.

Type : *Planorbis bicarinatus* Say.

¹ Aucune étude d'ensemble n'a encore été publiée sur les espèces du genre *Planorbis*. Les divers Planorbes présentent cependant des différences anatomiques considérables. Dans un travail déjà ancien (*Der Penis der einheimischen Planorben*, *Zeitschrift für die gesammten Naturwissenschaften*, XXX, 1867, pp. 363—367) FICINUS a montré que, d'après les organes mâles, les Planorbes d'Europe peuvent se grouper en deux séries : la première comprenant les *Planorbis vortex*, *Planorbis leucostoma*, *Planorbis spirorbis*, *Planorbis albus* et *Planorbis contortus* est caractérisée par un organe mâle pourvu d'un très élégant aiguillon calcaire ; la seconde (*Planorbis corneus*, *Planorbis nitidus*, *Planorbis fontanus*) est dépourvue de cet appareil. De plus, les *Planorbis nitidus* [= *Segmentina nitida*] et *Planorbis fontanus* ont un corps caverneux muni d'appendices coeaux qui manqueraient chez les autres espèces. Pour cette raison FICINUS propose de réunir ces deux derniers Planorbes dans le nouveau genre *Appendiculata* qu'il me paraît difficile d'adopter. Malgré tout l'intérêt présenté par ce mémoire, passé inaperçu et complètement oublié aujourd'hui—les recherches de FICINUS portent sur un trop petit nombre d'espèces pour servir de bases à une classification des Planorbes.

² DALL (W. H.), *Land and fresh water Mollusks of Alaska and adjoining country*, Harriman Alaska Expedition, XIII, New York, 1905, pp. — .

³ La synonymie et la distribution géographique des sous-genres sont données, dans la suite de ce Mémoire, à la place occupée par chacun d'eux.

Sous-Genre *TAPHIUS* H. et A. Adams, 1855.

Coquille comme celle des *Helisoma*, mais très ombiliquée en dessous ; dernier tour très dilaté vers l'ouverture, descendant à son extrémité ; ouverture fortement oblique.

Type : *Planorbis andecolus* d'Orbigny.

Sous-Genre *PLANORBELLA* Haldeman, 1842.

Coquille de taille moyenne, assez haute : spire formée de nombreux tours à croissance lente, très serrés les uns contre les autres, le dernier comprimé derrière une ouverture campanulée.

Type : *Planorbis campanulatus* Say.

Sous-Genre *TROPIDISCUS* Stein, 1850.

Coquille de taille médiocre, très déprimée ; spire composée d'un petit nombre de tours à croissance assez rapide, les premiers non carénés, le dernier grand, fortement caréné à la périphérie ; ouverture obliquement ovale.

Type : *Planorbis planorbis* Linné.

Sous-genre *DIPLODISCUS* Westerlund, 1897.

Coquille de petite taille, tout à fait déprimée ; spire formée de nombreux tours à croissance lente et régulière, le dernier médiocre (souvent à peine plus grand que l'avant dernier) fortement caréné à la périphérie ; ouverture obliquement ovale.

Type : *Planorbis vortex* Linné.

Sous-Genre *PARASPIRA* Dall, 1905.

Coquille de petite taille, très déprimée ; spire formée de nombreux tours à croissance lente et régulière le dernier médiocre, non caréné, mais bien arrondi ; ouverture arrondie, souvent bordée intérieurement.

Type : *Planorbis rotundatus* Poiret.

Sous-Genre *TROPICORBIS* Brown et Pilsbry, 1914.

Coquille de taille médiocre déprimée mais non très aplatie ; spire formée de nombreux tours à croissance lente et régulière, le dernier médiocre, mais sensiblement plus grand que l'avant dernier, bien arrondi ; ouverture subarrondie, sans bourrelet interne.

Type : *Planorbis maya* Morelet.

Sous-Genre *BATHYOMPHALUS* Agassiz, 1837.

Coquille petite, relativement haute ; spire formée de nombreux tours à enroulement très lent et très régulier en dessus, plus rapide

en dessous ; dernier tour petit, arrondi ; ouverture très étroitement semi-lunaire.

Type: *Planorbis contortus* Linné.

Sous-Genre *GYRAULUS* Agassiz, 1837.

Coquille petite, déprimée ; spire composée d'un petit nombre de tours à croissance rapide ou très rapide ; dernier tour toujours grand, dilaté à son extrémité, muni d'une carène périphérique plus ou moins accentuée ; test très souvent garni d'une sculpture réticulée ou hispide.

Type: *Planorbis albus* Müller.

Sous-Genre *TORQUIS* Dall, 1905.

Coquille petite, bien déprimée, surtout en dessus ; spire composée d'un petit nombre de tours à croissance rapide, le dernier grand, caréné ; sculpture seulement formée de stries longitudinales.

Type: *Planorbis parvus* Say.

Sous-Genre *ARMIGER* Hartmann, 1840.

Coquille très petite, sublenticulaire ; spire composée seulement de $2\frac{1}{2}$ — $3\frac{1}{2}$ tours à croissance très rapide, le dernier grand, fortement caréné, garni de côtes lamelleuses et espacées faisant saillie à la périphérie ; ouverture subcordiforme, entourée d'un péristome subcontinu.

Type: *Planorbis crista* Linné.

Sous-Genre *HIPPEUTIS* Agassiz, 1837.

Coquille petite, lenticulaire, très aplatie, étroitement ombiliquée en dessous ; spire formée de tours peu nombreux, le dernier très embrassant et fortement caréné ; ouverture cordiforme très allongée ; test très brillant.

Type: *Planorbis fontanus* Lightfoot.

Sous-Genre *DREPANOTRÉMA* Crosse et Fischer, 1880.

Coquille petite ; spire composée de tours nombreux, le dernier embrassant en dessus, arrondi à la périphérie.

Type: *Planorbis yzabalensis* Crosse et Fischer.

Sous-Genre *MENETUS* H. et A. Adams, 1855.

Coquille petite, sublenticulaire déprimée ; spire composée d'un petit nombre de tours à croissance rapide ; dernier tour grand, non embrassant, bien caréné ; ouverture subcordiforme transverse ; test avec une sculpture spirale plus ou moins accentuée, rarement absente.

Type: *Planorbis opercularis* Gould.

Sous-Genre *PLANORBIS* sensu stricto.

1850. *Spirodiscus* STEIN, *Die lebenden Schnecken und Muscheln d. Umgegend Berlins*, Berlin, p. 73 [= *Planorbis* sensu stricto + *Paraspira*].
1855. *Coretus* MOQUIN-TANDON, *Hist. Mollusques terr. et fluv. France*, Paris, II, p. 424 et p. 445 [type : *Planorbis corneus* Linné].
1864. *Spirodiscus* MÖRCH, *Vidensk. Meddels. Kjöbn.*, p. 309.
1885. *Coretus* WESTERLUND, *Fauna d. palæarct. region Binnenconchylien*, V, p. 65, No. 1 [type : *Planorbis corneus* Linné].
1885. *Menetus* WESTERLUND, *loc. supra cit.*, V, p. 68, No. 2 (type : *Planorbis Boissyi*, POTIEZ et MICHAUD) [non *Menetus* H. et A. ADAMS, 1855].
1886. *Coretus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, Ed. 2, Band XVII, Nürnberg, p. 32, No. 1 [type : *Planorbis corneus* Linné].
1897. *Spirodiscus* WESTERLUND, *Acta Societ. pro Fauna et Flora Fennicae*, XIII, No. 7, p. 112 (type : *Planorbis corneus* Linné).
1902. *Spirodiscus* WESTERLUND, *Acta Acad. Sc. Slavon. Merid. Zagrabiae*, CI, I, p. 120 [type : *Planorbis corneus* Linné].
1905. *Planorbis* sensu stricto DALL, *Land and Freshwater Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New York, p. 81 et p. 84 [type : *Planorbis corneus* Linné].

Coquille grande, discoïde, ombiliquée en dessus et en dessous ; spire composée d'un petit nombre de tours ordinairement arrondis en dessus et en dessous ; ouverture subovale.

Type : *Planorbis corneus* Linné.

Les espèces appartenant au sous-genre *Planorbis* sensu stricto vivent dans tout le système paléarctique et en Asie, en Afrique et à Madagascar.

§ I.

Planorbis (Planorbis) corneus Linné.

1758. *Helix cornea* LINNÉ, *Systema Naturae*, Ed. X, p. 770 [non DRAPARNAUD].
1774. *Planorbis purpurea* MÜLLER, *Vermium terr. et fluv. Histor.*, II, p. 154.
1774. *Planorbis similis* MÜLLER, *loc. supra cit.*, II, p. 154.
1777. *Helix nana* PENNANT, *British Zoolog.*, I, p. 133 (juv.), pl. lxxxiii, fig. 125.
1778. *Helix cornu arietis* DA COSTA *British Conchology*, p. 60, pl. xli, fig. 13 [non LINNÉ].
1801. *Planorbis corneus* POIRET, *Coquilles Aisne environs Paris, Prodrome*, p. 57.
1805. *Planorbis corneus* DRAPARNAUD, *Histoire Mollusques terr. fluv. France*, p. 43, pl. i, fig. 42 à 44.
1835. *Planorbis corneus* ROSSMÄSSLER, *Iconographie d. Land-und Süswasser-Conchylien*, II, p. 14, pl. vii, fig. 113.
1851. *Planorbis corneus* DUPUY, *Histoire Mollusques terr. fluv. France*, p. 431, pl. xxi, fig. 6.
1855. *Planorbis corneus* MOQUIN-TANDON, *Histoire Mollusques terr. fluv. France* II, p. 445, pl. xxxi, fig. 32 à 38, et pl. xxxii, fig. 1 à 6.
1856. *Planorbis corneus* DUNKER, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 35, No. 2, taf. vii, fig. 4 à 9 et 16 à 18.
1875. *Planorbis corneus*, WESTERLUND. *Malakozool Blätter*, XXII, p. 99 No. 1.

1878. *Planorbis corneus* SOWERBY, Monograph of the genus *Planorbis*, in: REEVE, *Conchologia Iconica*, XX, pl. i, fig. 1.
 1878. *Planorbis corneus* NEVILL, Handlist Mollusca Indian Museum, Calcutta, I, p. 241, No. 1.
 1822. *Planorbis corneus* LOCARD, Prodrôme, Catalogue Mollusques terr. fluvi. France, p. 192.
 1885. *Planorbis corneus* WESTERLUND, Fauna d. paläarct. region Binnenconchyl. V, p. 65, No. 1.
 1893. *Planorbis corneus* LOCARD, Coquilles fluviatiles, France, p. 53, fig. 37.
 1913. *Planorbis* [*Coretus*] *corneus* GERMAIN, Mollusques France et régions voisines, Paris, p. 251, fig. 317—318.

LOCALITÉS.

Allemagne : Heidelberg [Coll. G. NEVILL].

Angleterre : sans localité précise [Coll. G. NEVILL].

Autriche : sans localité précise [Coll. DR. F. STOLICZKA].

France : sans localité précise [Coll. G. NEVILL].

Répandu plus ou moins abondamment dans les eaux douces de toute l'Europe¹ et d'une partie de l'Asie Antérieure, le *Planorbis corneus* Linné est une des espèces les plus polymorphes du genre. Ce polymorphisme porte, non seulement sur la taille et la coloration de la coquille, mais encore sur le mode d'enroulement des tours et, principalement, sur le rapport :

épaisseur [= hauteur] de la coquille
diamètre maximum de la coquille

qui est susceptible de varier dans des limites relativement considérables.

Cette grande variabilité a conduit quelques auteurs, et notamment J. R. BOURGUIGNAT, à créer aux dépens du *Planorbis corneus* Linné un grand nombre d'espèces, de valeur très discutable,² dont les suivantes ont été décrites jusqu'à ce jour :

Planorbis corneus LINNÉ.³

Planorbis grandis DUNKER [in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 1856, p. 35, No. 1, taf. vii, fig. 4—6].

Planorbis megistus BOURGUIGNAT [Aperçu faune malacologique Bas Danube, *Annales de Malacologie*, I, 1870, p. 37, pl. iii, fig. 1—3]—Valachie, Hongrie, cours inférieur du Danube.

Planorbis Berlani BOURGUIGNAT [Valachie, Bulgarie.]

Planorbis Penchinati BOURGUIGNAT [Aperçu faune malacologique Bas Danube, *Annales de Malacologie*, I, 1870, p. 39, pl. iii, fig. 4—6].—Hongrie, Valachie.

¹ Sauf dans la péninsule ibérique où le *Planorbis corneus* Linné est remplacé par le *Planorbis Dufouri* Graells et ses variétés.

² Ce sont quelquefois des variétés ou des formes locales, mais, le plus souvent, de simples formes individuelles ou même des anomalies.

³ Le DR. C. A. WESTERLUND [*Fauna der paläarct. region Binnenconchylien*, V, 1885, p. 66] a décrit une variété *pinguis* figurée par le DR. W. KOBELT [in: ROSS MÄSSLER, *Iconographie der Land-und Süßwasser-Mollusken*, n. f., fig. 1927].

Planorbis metatarsius SERVAIN [Histoire malacologique lac Balaton 1881, p. 79].—Le Danube, la Drave, la Save.

Planorbis elophilus BOURGUIGNAT [*Aménités malacologiques*, II, 1859, p. 128, pl. xvi, fig. 1—3; = *Planorbis cornea microstoma* PARREYSS MSS., in: BOURGUIGNAT, *loc. supra cit.*, p. 128 (non: *Planorbis helephilus* D'Orbigny)].—Presque toute l'Europe centrale, notamment la Galicie, la Hongrie et la Bavière: çà et là, en France.

Planorbis praeclarus LETOURNEUX [in: SERVAIN, *Histoire malacologique lac Balaton*, 1881, p. 80].—La Drave, la Save, le Danube; la Serbie.

Planorbis Tacitei LETOURNEUX [*Planorbis tacitianus* LETOURNEUX in: SERVAIN, *Histoire malacologique lac Balaton*, 1881, p. 82 (sans description)].—Europe centrale, France.

Planorbis Conemoni LETOURNEUX [in: SERVAIN, *Histoire malacologique lac Balaton*, 1881, p. 82 (sans description)].—Valachie, Grèce.

Planorbis stenostoma BOURGUIGNAT [in: SERVAIN, *Histoire malacologique lac Balaton*, 1881, p. 82; = *Planorbis similis* Kim., non BIELZ].—Les bords du Danube.

Planorbis etruscus ZEIGLER [in: MOUSSON, *Coquilles Schlaefli Orient*, 1859, p. 36; et: BOURGUIGNAT, *Aménités malacologiques*, II, 1859, p. 127, pl. xviii; fig. 1 à 5.].—La Transcaucasie, l'Anatolie, la Turquie d'Europe, les provinces danubiennes, la Lombardie. Il existe une variété *danubialis* BOURGUIGNAT [Aperçu faune malacologique bas Danube, *Annales de Malacologie*, I, 1870, p. 39] vivant dans le bas Danube et ses affluents.

Planorbis udelosius BOURGUIGNAT [*Aménités malacologiques*, II, 1859, p. 131, pl. xvi, fig. 13—15].—La Toscane, notamment aux environs de Pise.

Planorbis Mabiliei BOURGUIGNAT [*Mollusques nouveaux, litigieux ou peu connus*, fasc. II, Janvier 1870, p. 25, pl. iv, fig. 1—3, subn. *Planorbis Mabilii*].—France.

Planorbis Nordenskioldi BOURGUIGNAT [*Aménités malacologiques*, II, 1859, p. 129; = *Planorbis corneus* NORDENSKIOLD et NYLANDER, *Finlands Mollusker*, 1856, p. 60, pl. iv, fig. 48; = *Planorbis corneus* variété *ammonoceras* WESTERLUND, *Exposé critique Mollusques terr. fluvial. Suède, Norvège*, 1871, p. 124; et: *Malakozoolog. Blätter*, XXII, 1875, p. 99, taf. iii, fig. 1—3].—Europe septentrionale.

Planorbis banaticus LANG [in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 1856, p. 38, taf. vii, fig. 13—15; = *Planorbis ruber* PARREYSS in: MARTINI et CHEMNITZ, *loc. supra cit.*; = *Planorbis transylvanicus* STENTZ, *ibid.*; = *Planorbis similis* BIELZ, non KIM.].—La Russie, la Transylvanie, le Banat, la Hongrie, le Tyrol. S. CLESSIN a décrit, sous le nom de *Planorbis banaticus* variété *gredleri* [Excurs. s. *Öster.-Ungarns und der Schweiz.*, 1889, une forme du Tyrol, près de Riva, qui est le *Planorbis corneus* variété *etruscus* GREDLER (non: *Planorbis etruscus* BOURGUIGNAT)].

Planorbis anthracius BOURGUIGNAT [*Aménités malacologiques*, II, 1859, p. 130, pl. xvii, fig. 1—3; = *Planorbis nigra* PARREYSS mss., in: BOURGUIGNAT, loc. *supra cit.*].—Les provinces danubiennes, notamment aux environs de Bucarest.

* * *

Il serait facile d'augmenter le nombre de ces prétendues espèces qui, toutes, doivent être rattachées au *Planorbis corneus* Linné, un certain nombre comme simples synonymes, d'autres comme variétés locales. En examinant une longue série d'individus de ce Planorbe, ou est frappé du fait suivant. Chez quelques formes la coquille, relativement haute par rapport à son diamètre maximum, possède une spire à enroulement assez rapide avec un dernier tour proportionnellement très grand; d'autres formes, au contraire, montrent une coquille peu haute par rapport au diamètre maximum et un enroulement plus lent, plus régulier, avec un dernier tour proportionnellement moins grand. Ces deux catégories correspondent aux deux modes principaux que présentent les coquilles du *Planorbis corneus* Linné et, de ce point de vue, les formes énumérées précédemment se classent de la manière suivante.

A.] *Coquille haute; spire à enroulement rapide, dernier tour grand:*

Planorbis corneus Linné.
Planorbis megistus Bourguignat.
Planorbis grandis Dunker.
Planorbis Berlandi Bourguignat.
Planorbis Penchinati Bourguignat.
Planorbis Conemoni Letourneux.
Planorbis Tacitei Letourneux.
Planorbis metatarsius Servain.
Planorbis stenostoma Bourguignat.
Planorbis etruscus Zeigler.
Planorbis adelosius Bourguignat.
Planorbis elophilus Bourguignat.

B]. *Coquille peu haute; spire à enroulement lent; dernier tour médiocre.*

Planorbis praeclarus Letourneux.
Planorbis Mabilleyi Bourguignat.
Planorbis Nordenskiöldi Bourguignat.
Planorbis banaticus Lang.
Planorbis anthracius Bourguignat.

Dans beaucoup d'échantillons de ces Planorbes on observe que le dernier tour est plus ou moins descendant aux environs de l'ouverture. Ce caractère, parfois très accentué, est évidemment une anomalie individuelle, un commencement de subscalarité, et n'a, par conséquent, aucune valeur spécifique. Il a cependant été retenu par J. R. BOURGUIGNAT: son *Planorbis elophilus*¹ n'est

¹ Les autres caractères donnés par J. R. BOURGUIGNAT: taille plus grande [que chez le *Planorbis corneus* Linné] et tours plus arrondis, non comprimés à la

qu'une monstruosité pouvant se retrouver chez tous les Planorbes du groupe¹ Beaucoup plus rarement on peut constater une malformation exactement inverse: le dernier tour, d'abord normal, se décolle près de l'ouverture et se relève vers le haut au lieu de s'infléchir vers le bas.

La taille varie dans des proportions considérables: elle atteint son maximum chez la forme nommée *Planorbis megistus*² par J. R. BOURGUIGNAT (jusqu'à 46 millimètres de diamètre maximum et 18 millimètres de hauteur) et son minimum chez quelques formes du *Planorbis banaticus* Lang qui, bien qu'adultes, ne dépassent par 16 à 18 millimètres de diamètre maximum.³

Le test subit également d'intéressantes modifications. Il est quelquefois très mince, comme dans la forme que j'ai nommée *Planorbis Tacitei* variété *lutetianensis* Germain où⁴ il est presque pellucide, d'un corné roux vineux et à peu près transparent.⁵ Il est, d'autres fois, très épais. C'est le cas d'une coquille de grande taille, appartenant au Musée de Turin et qui m'a été communiquée, en 1905, par mon collègue et ami CARLO POLLONERA. Je lui ai donné le nom de *Planorbis corneus* variété *ponderosa* Germain, nom resté manuscrit. C'est une coquille au test très épais, pesant, recueillie, en Roumanie, sur les bords du fleuve Bistritza.

La coloration varie beaucoup. Le test du *Planorbis corneus* Linné est ordinairement d'un brun rougeâtre plus ou moins lavé de vert sombre ou de vert olive; il devient presque rouge chez quelques mutations *ex colore* du *Planorbis banaticus* Lang (notamment chez la forme nommée *Planorbis ruber* par PARREYSS); il est noir chez la variété *nigra* Germain⁶ du *Planorbis Mabiliei* Bourguignat⁷ et d'un magnifique noir brillant chez le *Planorbis anthracinus* Bourguignat.

base, ne résistent pas à l'examen. Il y a des *Planorbis corneus* Linné dont les tours sont parfaitement arrondis et d'autres qui sont aussi grands que les plus grands échantillons de *Planorbis elophilus* Bourguignat.

¹ C'est ainsi que des *Planorbis corneus* Linné recueillis à Rambouillet (Seine-et-Oise) ont une coquille peu haute et une spire à enroulement lent (ce qui en fait des *Planorbis Mabiliei* Bourguignat) tandis qu'ils montrent un dernier tour aussi infléchi que chez les exemplaires les plus typiques du *Planorbis elophilus* Bourguignat. Voici donc des Planorbes qui sont, à la fois, des *Mabiliei* et des *elophilus*.

² Cette forme n'est qu'une variété *major* du *Planorbis corneus* Linné typique.

³ Il existe en France une forme naine du *Planorbis corneus* Linné. Elle est encore peu connue; je l'ai antrefois recueillie assez abondamment aux environs d'Angers (Maine-et-Loire). Bien que parfaitement adulte, elle atteint seulement 10-12 millimètres de diamètre maximum. Elle mériterait d'être distinguée sous le nom de variété *tytthus* Germain.

En dehors de cette forme, j'ai signalé [GERMAIN (LOUIS), *Etude Mollusques terrestres fluvial, environs d'Angers et département de Maine-et-Loire*, 1903, p. 187] une variété *B. minor* qui ne mesure que 16 à 20 millimètres de diamètre maximum tandis que le *Planorbis corneus* Linné atteint de 30 à 35 millimètres de diamètre maximum.

⁴ GERMAIN (LOUIS), *loc. supra cit.*, 1903, p. 188, pl. ii, fig. 27 (*Planorbis tacitianus* var. *γ lutetianus*).

⁵ La variété *lutetianensis* Germain vit dans les Seine, au quai de Javel, dans Paris même.

⁶ GERMAIN (LOUIS), *loc. supra cit.*, 1903, p. 190, note 1.

⁷ La variété *nigra* a été trouvée dans les fossés voisins de l'Indre, à Château-roux (Indre).

Ces quelques détails montrent l'étendue du polymorphisme chez le *Planorbis corneus* Linné. J'aurai, dans un travail ultérieur, à revenir sur cette question et à préciser certains points que je n'ai pu qu'effleurer ici.

§ II.

Planorbis (Planorbis) metidjensis Forbes.

- 1838. *Planorbis metidjensis* FORBES, Moll. Alger., *Annals and Magazine Natural History*, London, p. 254, pl. xii, fig. 5 (La planche n'a été publiée qu'en 1839).
- 1859. *Planorbis metidjensis* BOURGUIGNAT, *Aménités malacologiques*, II, p. 132, et *Revue et Magasin de Zoologie*, No. 12.
- 1864. *Planorbis metidjensis* BOURGUIGNAT, *Malacologie Algérie*, II, p. 146, pl. ix, fig. 1—3.
- 1885. *Planorbis metidjensis* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 68, No. 4.
- 1886. *Planorbis Metidjensis* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 172, No. 159, taf. xxv, fig. 7.
- 1890. *Planorbis metidjensis* WESTERLUND, *loc. supra cit.*, suppl. I, p. 82, No. 4.
- 1899. *Planorbis metidjensis* LOCARD, *Conchyliologie portugaise*, *Archives Muséum Hist. natur. Lyon*, VII, p. 175.

LOCALITÉ.

Algérie: Mustapha, aux environs d'Alger; cinq exemplaires, No. P. 100 B.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe, découvert en Algérie ou il n'est pas rare, vit également au Maroc (P. PALLARY¹), en Espagne et au Portugal [A. NOBRE, A. LOCARD].

Les plus grands individus mesurent 18 millimètres de diamètre maximum; c'est dire qu'ils sont à peu près de taille normale, le type atteignant ordinairement 17 millimètres de diamètre maximum et 5 millimètres de hauteur.

Le test montre des stries longitudinales fines, serrées, et obliques, coupées de stries spirales bien plus fortes, peu sensibles en dessus, mais accentuées en dessous même sur les premiers tours.

Variété *Dufouri* Graëlls.

- 1845. *Planorbis corneus*, variété, MORELET, *Description Mollusques terr. fluvial. Portugal*, Paris, p. 78 [non LINNÉ].
- 1846. *Planorbis Dufouri* GRAËLLS, *Catal. de los Moluscos España*, p. 11, pl. i, fig. 11 à 15.
- 1846. *Planorbis legatorum* ROSSMÄSSLER, *Zeitschrift für Malakozool.*, p. 173.
- 1853. *Planorbis metidjensis* MORELET, *Journal de Conchyliologie*, IV, p. 294 [non FORBES].
- 1859. *Planorbis Dufouri* ROSSMÄSSLER, *Iconogr. der Land-und Süßwasser-Mollusken*, XVIII, p. 135, taf. lxxxviii, fig. 967.

¹ PALLARY (P.), Quatrième Contribution faune Malacologique N.O. Afrique, *Journal de Conchyliologie*, LII, 1904, p. 54.

1859. *Planorbis Dufouri* BOURGUINAT, *Aménités malacologiques*, II, p. 133, pl. xvii, fig. 7 à 9 (subn. *Planorbis Dufouri* var. *minor*).
 1864. *Planorbis Dufouri* BOURGUIGNAT, *Malacologie Algérie*, II, p. 147, pl. ix, fig. 4 à 9.
 1875. *Planorbis Dufouri* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 102, No. 2.
 1885. *Planorbis melidjensis* variété *Dufouri* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 68.
 1886. *Planorbis Dufourii* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, p. 63, No. 35, taf. xii, fig. 20 à 22.
 1887. *Planorbis Dufouri* CASTRO, *Jornal sc. mathemat. phys. natur. Lisboa*, XLIV, p. 8 (des tirés à part).
 1890. *Planorbis melidjensis* variété *Dufouri* WESTERLUND, *loc. supra cit.*, suppl. I, p. 82.
 1899. *Planorbis Dufouri* LOCARD, *Conchyliologie portugaise*, *Archives Muséum Hist. natur. Lyon*, VII, p. 174.

LOCALITÉS.

Algérie : Douara ; 3 exemplaires.

Portugal : Monchique, un exemplaire, No. P. 100 B.

DISTRIBUTION GÉOGRAPHIQUE.

Commun ou assez commun suivant les localités en Espagne [M. P. GRAËLLS,¹ DR. G. SERVAIN²] et au Portugal [J. DA SILVA E CASTRO,³ A. LOCARD,⁴ A. MORELET,⁵ A. NOBRE,⁶ DR. PAULINO,⁷ DR. ROSA,⁷ etc. . .], cette variété vit également en Algérie [J. R. BOURGUIGNAT⁸] et au Maroc (P. PALLARY⁹).

Le *Planorbis* (*Planorbis*) *Dufouri* Graëlls n'est bien certainement qu'une variété du *Planorbis* (*Planorbis*) *melidjensis* Forbes se distinguant : par son enroulement plus régulier avec un dernier tour parfaitement arrondi et non comprimé de bas en haut ; par son ouverture moins oblique et mieux arrondie ; par son test plus fragile, plus transparent, plus finement strié.

On voit que ces caractères sont de peu d'importance, d'autant que de nombreuses formes de passage existent entre le type et la variété.

L'exemplaire du Portugal est très typique. Il mesure 12½ millimètres de diamètre maximum, 10½ millimètres de diamètre minimum et 6 millimètres de hauteur maximum (l'ouverture a 6

¹ GRAËLLS (M. P.), *loc. supra cit.*, 1846, p. 11.

² SERVAIN (DR. G.), *Etude Mollusques recueillis Espagne et Portugal*, Saint Germain, août 1880, p. 140.

³ CASTRO (J. DA SILVA E.), *Contributions à la faune malacologique du Portugal*, III, *Planorbes* du groupe du *Dufouri*, *Jornal sc. mathemat. phys. natur. Lisboa*, XLIV, 1887, p. 8—9 (des tirés à part).

⁴ LOCARD A., *loc. supra cit.*, 1899, p. 174.

⁵ MORELET (A.), *Description des Mollusques terr. et fluviat. du Portugal*, Paris, 1849, p. 78 (sous le nom de *Planorbis corneus* variété).

⁶ NOBRE (A.), *Catalogue des Mollusques des environs de Coïmbre, Portugal Annales société royale malacologique Belgique*, XX, Bruxelles, 1885, p. 14.

⁷ In : NOBRE (A.), *loc. supra cit.*, XX, 1885, p. 14.

⁸ BOURGUIGNAT (J. R.), *Malacologie de l'Algérie*, II, Paris, 1864, p. 147.

⁹ PALLARY (P.), *loc. supra cit.*, LII, 1904, p. 54.

millimètres de hauteur et $5\frac{1}{2}$ millimètres de diamètre maximum). Le test est très mince, léger, fragile, d'un beau corne clair un peu ambré, absolument transparent; en dessus, les stries longitudinales sont fort tenues, serrées et obliques, coupées de stries spirales plus fortes et assez espacées; en dessous, la sculpture est la même mais plus délicate.

Les individus algériens appartenant au Musée de Calcutta¹ doivent être rapportés au *Planorbis (Planorbis) algericensis* Bourguignat² qui n'est qu'une forme du *Planorbis (Planorbis) Dufouri* Graëlls. Les caractères distinctifs sont, en effet, des plus faibles: l'*algericensis* a une ouverture parfaitement arrondie; sa spire se compose de 4 tours au lieu de $4\frac{1}{2}$ comme chez le *Dufouri*; son test est presque lisse, très finement strié; enfin sa taille est plus petite: 8 millimètres de diamètre maximum et 4 millimètres de hauteur tandis que le *Dufouri* atteint 16 millimètres de diamètre maximum et 8 millimètres de hauteur. Cependant J. S. CASTRO³ a signalé une forme *major* du *Planorbis (Planorbis) algericensis* Bourguignat mesurant 12 millimètres de diamètre maximum et, par suite, intermédiaire.

Quant au *Planorbis (Planorbis) aclopus* Bourguignat⁴ ce n'est encore qu'une variété du *Planorbis (Planorbis) metidjensis* Forbes se rapprochant de la variété *Dufouri* Graëlls; mais il est, en général, de taille plus petite avec un dernier tour aplati inférieurement et dilaté vers l'ouverture. J. S. CASTRO⁵ a signalé une forme *major* (atteignant 11 millimètres de diamètre maximum) et A. LOCARD⁶ une forme *maxima* (diamètre maximum: 17—18 millimètres). De plus, A. LOCARD⁷ a décrit une mutation *ornata* dont le test, de coloration plus foncée, est orné de stries spirales prononcées.

¹ Ils sont d'assez petite taille, le plus grand ayant seulement 10 millimètres de diamètre maximum, $8\frac{1}{2}$ millimètres de diamètre minimum et 5 millimètres de hauteur. L'ouverture est à peu près circulaire (4 millimètres de hauteur et de diamètre) et curieusement bordée de brun rougeâtre; le test est assez solide, corne très clair, un peu luisant, garni d'une sculpture d'une grande délicatesse.

² *Planorbis Dufouri* var. *B. algerica* BOURGUIGNAT, *Aménités malacologiques*, II, 1859, p. 139, pl. xvii, fig. 7—9; et *Malacologie Algérie*, II, 1864, p. 148, pl. ix, fig. 7—9; = *Planorbis metidjensis* variété *dufourii* forma *algerica* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, 1885, p. 68; = *Planorbis Algericus* CASTRO, *Jornal sc. mathemat. phys. natur. Lisboa*, No. XLIV, 1887, p. 9 (des tirés à part); = *Planorbis algericus* LOCARD, *Conchyliologie portugaise*, *Archives Muséum Hist. natur. Lyon*, VII, 1899, p. 175.

³ CASTRO (J. DA SILVA E), *loc. supra cit.*, 1887, p. 9.

⁴ *Planorbis aclopus* BOURGUIGNAT, *Aménités malacologiques*, II, 1859, p. 135, pl. xvii, fig. 4—6; et: *Malacologie Algérie*, II, 1864, p. 149, pl. ix, fig. 10—12; = *Planorbis metidjensis* variété *aclopus* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, 1885, p. 68; = *Planorbis aclopus* CLESSIN, *Die Familie der Limnaeiden*, in: MARTINI et CERNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 173, No. 160, taf. xxvi, fig. 5; = *Planorbis aclopus* CASTRO, *Jornal sc. mathemat. phys. natur. Lisboa*, No. XLIV, 1887, p. 9 (des tirés à part); = *Planorbis metidjensis* var. *aclopus* WESTERLUND, *loc. supra cit.*, Suppl. I, 1890, p. 83; = *Planorbis aclopus* LOCARD, *Conchyliologie portugaise*, *Archives Muséum Hist. natur. Lyon*, VII, 1899, p. 175.

⁵ CASTRO (J. DA SILVA E), *loc. supra cit.*, 1887, p. 9 [*Planorbis aclopus* var. *major*].

⁶ LOCARD (A.), *loc. supra cit.*, 1899, p. 176 [*Planorbis aclopus* var. *maxima*].

⁷ LOCARD (A.), *loc. supra cit.*, 1899, p. 176 [*Planorbis aclopus* var. *ornata*].

La variété *aclopus* Bourguignat est commune au Portugal où elle a été signalée aux environs de Lisbonne, de Coïmbre, de Porto ; à Ericeira, Sernache dos Athos, Pavao de Varzin, Estoy, Roucão, Praia da Granja, etc. [J. DA S. E CASTRO, A. LOCARD, PAULINO D'OLIVEIRA]. Elle est assez variable et on doit lui rapporter les *Planorbis Castroi* Bourguignat,¹ *Planorbis lepidophorus* Castro,² *Planorbis Renei* Castro,³ *Planorbis lusitanicus* Castro,⁴ *Planorbis Carvalhoi* Castro⁵ et *Planorbis Rosai* Castro.⁶ Ces divers *Planorbis* diffèrent de la variété *aclopus* Bourguignat par des détails si peu importants que toute distinction serait vaine. Quelques uns, comme les *Planorbis lepidophorus* Castro et *Planorbis Renei* Castro ont une sculpture formée de minces costulations spirales qui, à un fort grossissement, se résolvent " en spirales écailleuses placées à la suite les unes des autres. Ces écailles sont élargies à la base, effilées vers le sommet et recourbées ; elles sont fort caduques⁷". Remarquons que ce système sculptural se retrouve, plus ou moins net, chez toutes les espèces du groupe du *Planorbis* (*Planorbis*) *melidjensis* Forbès.

§ III.

Planorbis (*Planorbis*) *Boissyi* Potiez et Michaud.

1838. *Planorbis Boissyi* POTIEZ et MICHAUD, *Galerie Mollusques Douai*, I, p. 208, pl. xxi, fig. 4-6.
 1839. *Planorbis Alexandrinus* ROTH, Dissert. inaug, p. 2, tab. ii, fig. 8 [non EHRENBURG].
 1817. *Planorbis Boissyi* SAVIGNY, *Description Egypte.*, pl. ii, fig. 26.
 1868. *Planorbis Boissyi* MORELET, *Mollusques terrestres fluviatiles Voyage Wetwitsch*, p. 39.
 1872. *Planorbis Boissyi* JICKELI, *Reisebericht*, p. 11.
 1874. *Planorbis Boissyi* JICKELI, *Fauna d. Land-und Süßwasser-Mollusken, Nord-Ost-Afrik.*, Dresden, p. 213, taf. vii, fig. 20.
 1880. *Planorbis Boissyi* KOBELT, *Iconographie d. Land-und Süßw.-Mollusk.*, V, p. 7, fig. 1934.
 1884. *Planorbis Boissyi* INNÈS, *Bulletins Société malacologique France*, I, p. 329.
 1884. *Planorbis Niloticus* BOURGUIGNAT in : INNÈS, *loc. supra cit.*, I, p. 330.
 1884. *Planorbis subsalinarum* INNÈS, *loc. supra cit.*, I, p. 331.
 1885. *Planorbis* (*Menetus*) *boissyi* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 68, No. 6.
 1886. *Planorbis Boissyi* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 130, No. 103, taf. xxii, fig. 2.

¹ BOURGUIGNAT (J. R.), in : CASTRO (J.), *loc. supra cit.*, 1887, p. 10 ; — LOCARD (A.), *loc. supra cit.*, 1899, p. 176.

² CASTRO (J.), *loc. supra cit.*, 1887, p. 10 ; — LOCARD (A.), *loc. supra cit.*, 1899, p. 176.

³ CASTRO (J.), *loc. supra cit.*, 1887, p. 11 ; — LOCARD (A.), *loc. supra cit.*, 1899, p. 176.

⁴ CASTRO (J.), *loc. supra cit.*, 1887, p. 12 ; — LOCARD (A.), *loc. supra cit.*, 1899, p. 177.

⁵ CASTRO (J.), *loc. supra cit.*, 1887, p. 12 ; — LOCARD (A.), *loc. supra cit.*, 1899, p. 177.

⁶ CASTRO (J.), *loc. supra cit.*, 1887, p. 12 ; — LOCARD (A.), *loc. supra cit.*, 1899, p. 177.

⁷ CASTRO (J.), *loc. supra cit.*, 1887, p. 10.

1890. *Planorbis niloticus* WESTERLUND, *loc. supra cit.*, Suppl. I, 84, No. 7a.
 1890. *Planorbis subsalinarum* WESTERLUND, *loc. supra cit.*, Suppl. I, p. 84, No. 7c.
 1898. *Planorbis Boissyi* POLLONERA, *Bollettino Musei anat. compar.*, Torino, XIII (4 Mars), p. 11.
 1904. *Planorbis Boissyi* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, X, p. 347, No. 1.
 1909. *Planorbis (Menetus) Boissyi* PALLARY, *Mémoires Institut Egyptien*, Le Caire, VI, fasc. I, p. 35, pl. iv, fig. 3-4.

LOCALITÉ :

Egypte : Alexandrie ; un exemplaire.

DISTRIBUTION GÉOGRAPHIQUE.

Toute la Basse Egypte, parfois très commun. Ce *Planorbe* vit aussi dans l'Erythrée italienne [Général DE BOCCARD].

Les *Planorbis niloticus* Bourguignat et *Planorbis subsalinarum* Innès¹ ne sont que des variations insignifiantes du *Planorbis Boissyi* Potiez et Michaud. Cette dernière espèce atteint une taille assez grande. L'exemplaire appartenant au Musée de Calcutta mesure 13½ millimètres de diamètre maximum, 11½ millimètres de diamètre minimum et 4 millimètres de hauteur. Le test est très encroûté, d'un brun verdâtre, garni de stries longitudinales assez fortes et bien obliques.

Planorbis (Planorbis) Rüppelli Dunker.

1848. *Planorbis Rüppelli* DUNKER, *Proceedings Zoological Society of London*, p. 42.
 1856. *Planorbis Rüppelli* DUNKER, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, p. 41, No. 7, taf. v, fig. 10 à 12.
 1866. *Planorbis Rüppelli* MARTENS, *Malakozoolog. Blätter*, p. 4.
 1869. *Planorbis Rüppelli* MARTENS, *Malakozoolog. Blätter*, p. 211.
 1870. *Planorbis Rüppelli* BLANFORD, *Geology and Zoology Abyssinia*, p. 473, No. 8.
 1872. *Planorbis Rüppelli* MORELET, *Annali Museo Civico di Storia Natur. di Genova*, III, p. 207.
 1874. *Planorbis Rüppelli* JICKELI, *Fauna d. Land-und Süßwasser-Mollusken Nord-Ost-Afrik.*, Dresden, p. 211, taf. vii, fig. 17—18.
 1878. *Planorbis Rüppelli* NEVILL, *Handlist Mollusca Indian Museum, Calcutta*, I, p. 942, No. 12.
 1881. *Planorbis Rüppelli* JICKELI, *Jahrbuch d. Deutsch. Malakozoolog. Gesellschaft*, p. 331.
 1883. *Planorbis Rüppelli* BOURGUIGNAT, *Histoire Malacolog. Abyssinie*, p. 100 et p. 127, et *Annales sciences natur.*, Zoologie, 6^e série, XV, même pagination.
 1898. *Planorbis Rüppelli* POLLONERA, *Bollettino Museo anat. compar. di Torino*, XIII, No. 313 (4 Mars), p. 11.
 1904. *Planorbis Rüppelli* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, X, p. 348, No. 2.

¹ C. F. ANCEY (Notes critiques et synonymiques, *Journal de Conchyliologie*, LIII, 1905, p. 321) avait déjà émis "l'avis que le *Pl. subsalinarum* Innès est la même espèce que le *Pl. Boissyi* Pot. et Mich."

1904. *Planorbis Rüppelli* DE ROCHEBRUNE et GERMAIN, *Mémoires Société Zoologique France*, p. 9.
 1906. *Planorbis Rüppelli* NEUVILLE et ANTHONY, *Bulletin Muséum Hist. natur. Paris*, XII, No. 6, p. 411.
 1908. *Planorbis Rüppelli* NEUVILLE et ANTHONY, *Annales sciences naturelles, Zoologie*, VIII, p. 249, fig. 1 (pars).

LOCALITÉS.

Nubie : Dongolo [Collect. W. T. BLANFORD].

Abyssinie : Rivières Haddas, Undul et Guna (Goona) [Coll. W. T. BLANFORD].

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe est connu de l'Erythrée italienne [Général DE BOCCARD] et de toute l'Abyssinie où il a été recueilli par de nombreux voyageurs [W. T. BLANFORD, A. ISSEL et BECCARI, DR. C. JICKELI, G. NEVILL, MAUR. DE ROTHSCHILD,¹ SCHULLER, etc.]. Plus au sud, il vit également dans l'Ouebi [DU BOURG DE BOZAS]. Il convient enfin de souligner la localité de Dongolo, en Haute-Egypte, d'où proviennent certains exemplaires du Musée de Calcutta [Coll. W. T. BLANFORD] qui étend singulièrement vers le nord l'arée de cette espèce. Mais n'y a-t-il pas eu confusion de localité de la part de W. T. BLANFORD ?

J. R. Bourguignat a séparé, sous le nom de *Planorbis Herbini*,² un Planorbe qui se distingue du *Planorbis Rüppelli* Dunker seulement par son enroulement un peu plus rapide, le dernier tour étant relativement plus grand. "L'*Herbini* diffère encore du *Rüppelli*,—ajoute J. R. BOURGUIGNAT—par son ouverture moins oblique, moins transversalement oblongue, mais presque ronde et aussi haute que large". Pour qui a étudié les variations du dernier tour de spire et de l'ouverture chez les Planorbes africains de ce groupe, de tels caractères apparaissent comme individuels et ne sauraient justifier la création d'espèces nouvelles : le *Planorbis Herbini* Bourguignat doit être considéré comme synonyme de l'espèce de W. DUNKER.

Le test du *Planorbis Rüppelli* Dunker est assez léger, mais à peine subtransparent et recouvert d'un épiderme de couleur variable : brun, marron, parfois presque noir, d'autres fois d'un corné clair légèrement teinté de verdâtre ; il est toujours plus clair en dessous. La sculpture comporte, en dessus, des stries longitudi-

¹ Cf. : NEUVILLE (H.) et ANTHONY (R.) [Recherches sur les Mollusques d'Abyssinie, *Annales sciences naturelles, Zoologie*, VIII, 1908, p. 250] qui ont signalé cette espèce, dans l'Abyssinie méridionale, jusqu'à 2400 mètres d'altitude.

² BOURGUIGNAT (J. R.), *Histoire malacologique de l'Abyssinie*, Paris, 1883, p. 101, et p. 127 ; et *Annales sciences naturelles, Zoologie*, 6^e série, XV, p. 101 et p. 127. C'est la coquille représentée par le DR. C. JICKELI (sous le nom de *Planorbis Rüppelli* Dunker), dans son grand ouvrage : Fauna der Land-und Süßwasser-Mollusken Nord-Ost Afrika's, *Nova Acta der Kaiserl. Leop.-Carol. Deutschen Akademie der Naturforscher*, Dresden, 1874, XXXVII, No. 1, p. 201, taf vii, fig. 18 (seulement).

³ BOURGUIGNAT (J. R.), *loc. supra cit.*, 1883, p. 101.

nales assez fortes, obliques, inégales et inégalement distantes avec, parfois, quelques côtes vers l'extrémité du dernier tour ; en dessous les stries longitudinales sont un peu plus délicates. Le test est souvent partiellement érodé et, plus souvent encore, plus ou moins fortement encroûté.

Les dimensions varient dans d'assez larges proportions. Voici les mensurations d'un certain nombre d'individus du Musée du Calcutta.

Principales Mensurations.	Localités :			Dimensions :		
	Dongolo.	Guna River.	Haddas River.	du type de DUNKER.	données par JICKELL.	données par NEUVILLE et ANTHONY
Diamètre maximum.	a : $13\frac{1}{2}$ mill. b : 12 — c : 11 —	a : 12 mill.	a : 12 mill. b : 10 — c : $9\frac{1}{2}$ — d : $9\frac{1}{2}$ —	$14\frac{1}{2}$ mill.	8 mill. $13\frac{1}{4}$ —	$11\frac{1}{2}$ mill.
Diamètre minimum.	a : $10\frac{1}{4}$ mill. b : 10 — c : 10 —	a : 10 mill.	a : $10\frac{1}{4}$ mill. b : $8\frac{1}{2}$ — c : $8\frac{1}{2}$ — d : $8\frac{1}{4}$ —	$12\frac{1}{2}$ mill.	„	„
Hauteur.	a : $4\frac{1}{2}$ mill. b : $4\frac{1}{2}$ — c : $4\frac{1}{2}$ —	a : $5\frac{1}{2}$ mill.	a : $4\frac{1}{2}$ mill. b : 4 — c : $4\frac{1}{2}$ — d : $4\frac{1}{2}$ —	6 mill.	$2\frac{3}{4}$ mill. 5 —	4 mill.
Diamètre de l'ouverture.	a : $5\frac{1}{4}$ mill. b : 5 — c : 5 —	a : 6 mill.	a : 5 mill. b : $4\frac{1}{2}$ — c : $4\frac{1}{2}$ — d : 4 —	6 mill.	„	„
Hauteur de l'ouverture.	a : 4 mill. b : $4\frac{1}{2}$ — c : 4 —	a : 5 mill.	a : 5 mill. b : 4 — c : $4\frac{1}{2}$ — d : 4 —	5 mill.	„	„

Planorbis (Planorbis) Hermannii Boettger.

1910. *Planorbis (Coretus) hermanni* BOETTGER, *Abhandlungen Senckenberg. Naturforsch. Gesellschaft Frankfurt a. M.*, XXXII, p. 452, No. 35, taf. xxviii, fig. 18a, 18b, 18c.
1912. *Planorbis hermanni* CONNOLLY, *Annals South African Museum*, XI, part III, p. 236, No. 498.

LOCALITÉS.

Afrique Australe: Omanbondé (Ovampoland); cinq individus.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe n'était connu que de Okaputa Pan, dans le Damaraland, où il avait été recueilli, à l'état subfossile, par le Dr. P. HERMANN.

Cette très intéressante espèce est encore peu connue. Des cinq individus appartenant au Musée de Calcutta, l'un est presque subfossile (exemplaire No. 1, du tableau ci-dessous), les autres ont été recueillis vivants. Leur test est d'un corné jaunâtre, plus clair en dessous qu'en dessus, et à peine brillant. Il est garni de stries longitudinales médiocres, irrégulières, inégales, très obliques, plus fortes et plus irrégulières sur la moitié aperturale du dernier tour où elles sont, de plus, irrégulièrement onduleuses.¹

La taille est assez variable comme le montre le tableau ci-dessous qui donne, en millimètres, les dimensions principales de quelques individus.

Numéros des Individus.	Diamètre Maximum.	Diamètre Minimum.	Hauteur Totale.	Diamètre de l'ouverture.	Hauteur de l'ouverture.
1	12 mill.	10½ mill.	4 mill.	4½ mill.	4½ mill.
2	10½ —	8½ —	3½ —	4 —	3½ —
3	10 —	8½ —	3½ —	4 —	4 —
4	9½ —	8 —	3½ —	3½ —	3½ —
5	8½ —	7½ —	3½ —	3½ —	3½ —

Le *Planorbis (Planorbis) Hermannii* Boettger a été très exactement figuré par le Dr. O. BOETTGER, et sa figuration correspond parfaitement à l'exemplaire No. 1 du tableau ci-dessus. Ce dernier est seulement de taille plus grande, les individus décrits par le naturaliste allemand ne mesurant que 8 à 9 millimètres de diamètre maximum pour 3½ millimètres de hauteur (L'ouverture a de 3¼ à 3½ millimètres de diamètre sur 3½ millimètres de hauteur).

Il est évident que ce Planorbe doit être subordonné au *Planorbis (Planorbis) Pfeifferi* Krauss² dont il se distingue seulement par les caractères secondaires suivants :

Il est, proportionnellement, plus déprimé ;

¹ Les stries longitudinales sont sensiblement aussi accentuées en dessous qu'en dessus.

² KRAUSS (F.), *Die Südafrikanischen Mollusken*, Stuttgart, 1848, p. 83, taf. v, fig. 7 [Espèce figurée par G. B. SOWERBY, Monograph in the genus *Planorbis*, in : L. REEVE, *Conchologia Iconica*, Vol. XX, London, 1878, pl. iv, fig. 33 ; et par S. CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systematische Conchylien-Cabinet*, XVII, Nürnberg, 1886, p. 87, No. 54, taf. x, fig. 26-28]. Le *Planorbis (Planorbis) Bowleri* MELVILL et PONSONBY [*Annals and Magazine of Natural History*, London, XII, 1893, p. 111, pl. iii, fig. 19] est presque certainement synonyme.

Le *Planorbis (Planorbis) Pfeifferi* Krauss est une espèce qui paraît répandue dans toute l'Afrique Australe où elle remplace le *Planorbis (Planorbis) Rüppelli* Dun. et de l'Afrique Orientale. Il est connu du Natal, du Zuzuland, du Lorenzo Marques, de la Rhodesia, du Transvaal et du Bechuanaland anglais.

Son dernier tour est nettement descendant sur sa moitié terminale : il en résulte que le bord supérieur de l'ouverture est toujours en dessous du plan de l'avant dernier tour, caractère très bien rendu sur les figures du DR. O. BOETTGER.

Mais le DR. O. BOETTGER ajoute que son espèce ne possède que $4\frac{1}{2}$ tours de spire alors que le *Planorbis (Planorbis) Pfeifferi* Krauss en compte 5. En réalité il existe, dans la collection du Musée de Calcutta, des individus ayant $4\frac{1}{2}$ et d'autres possédant 5 tours de spire ; d'ailleurs, chez cette espèce, ce caractère, qui dépend beaucoup du degré de développement de l'animal, n'a pas de valeur spécifique.

En résumé, le *Planorbis (Planorbis) Hartmanni* Boettger est une variété déprimée avec dernier tour descendant du *Planorbis (Planorbis) Pfeifferi* Krauss.

Planorbis (Planorbis) salinarum Morelet.

- 1868. *Planorbis salinarum* MORELET, *Mollusques terr. fluviat. voyage Welwitsch*, p. 43 et p. 86, No. 56, pl. V, fig. 4.
- 1904. *Planorbis salinarum* MARTENS, *Mollusken*, in : PASSARGE, *Die Kalahari*, Berlin, p. 756.
- 1907. *Planorbis salinarum* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XIII, p. 270.
- 1908. *Planorbis Rüppelli (pars)* NEUVILLE et ANTHONY, *Annales sciences naturelles, Zoologie*, VIII, p. 250.
- 1909. *Planorbis salinarum* NOBRE, *Bulletin Société portugaise sciences naturelles*, Lisbonne, III, suppl. III, p. 102.
- 1910. *Planorbis salinarum* GERMAIN, *Actes Société Linnéenne Bordeaux*, LXIV, p. 110, pl. I, fig. 2—3 et 13—14.
- 1912. *Planorbis salinarum* CONNOLLY, *Annals South African Museum*, XI, part III, p. 238, No. 963.
- 1916. *Planorbis salinarum* GERMAIN, *Seconde notice Malacologique*, in : *Documents scientifiques Mission TILHO*, III, Paris, p. 298.

LOCALITÉ :

Angola : sans localité précise ; 3 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

L'aire occupée par cette espèce est encore peu connue. Découverte dans l'Angola (district de Pungo-Adango, à plus de 350 kilomètres de la côte) par le Docteur FR. WELWITSCH, elle s'étend, au nord, jusqu'en Mauritanie [R. CHUDEAU et A. GRUVEL] en passant par les territoires du Sénégal-Niger [DR. A. GAILLARD] et, au sud, jusqu'au lac N'gami, dans le Bechuanaland¹ [DR. F. von MARTENS, in : PASSARGE].

Le Docteur E. von MARTENS² a identifié le *Planorbis salinarum* Morelet au *Planorbis Rüppelli* Dunker. Il est certain que les deux espèces sont fort voisines l'une de l'autre. Cependant il résulte de

¹ A l'état subfossile.

² MARTENS (DR. E. von), Ueber einige abyssinische Schnecken, *Malakozoolog. Blätter*, 1869, p. 211.

l'étude des cotypes donnés par A. MORELET au Muséum national d'Histoire naturelle de Paris¹ que le *salinarum* a un enroulement assez différent et que sa hauteur (=épaisseur) est toujours proportionnellement plus faible. Je considère actuellement, d'après les matériaux que j'ai pu consulter, le *Planorbis salinarum* Morelet comme l'espèce représentative, en Afrique occidentale, du *Planorbis Rüppelli* Dunker, de l'Afrique orientale.

A. MORELET² donne, à son *Planorbe*, 5½ tours convexes des deux côtés avec un dernier tour "comprimé à la périphérie, mais pas assez, toutefois, pour produire un angle bien marqué." Il indique, comme dimensions, 15½ millimètres de diamètre maximum, 13 millimètres de diamètre minimum et 4½ millimètres de hauteur. Les exemplaires du Musée de Calcutta, bien que typiques, sont de beaucoup plus petite taille : 6—7½ millimètres de diamètre maximum, 4½—5½ millimètres de diamètre minimum et 2½—3 millimètres de hauteur. Ils appartiennent à une variété *minor*. Leur test est mince, subtransparent, corné fauve un peu verdâtre en dessous. Les stries longitudinales sont fines, serrées, obliquement onduleuses en dessus, un peu plus fines et très serrées en dessous.

Planorbis (Planorbis) sudanicensis Martens.

1870. *Planorbis sudanicus* MARTENS, *Malakozoolog. Blätter*, XVII, p. 35.
1871. *Planorbis sudanicus* MARTENS, in : PFEIFFER, *Novitates Concholog.* IV, p. 23, No. 694, pl. xiv, fig. 6—9.
1886. *Planorbis sudanicus* CLESSIN, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, p. 135, taf. xxii, fig. 5.
1890. *Planorbis sudanicus* BOURGUIGNAT, *Histoire malacologique lac Tanganika*, p. 15, pl. i, fig. 13—15¹ et : *Annales sciences naturelles*, X, p. 15, pl. i, fig. 13—15.
1894. *Planorbis sudanicus* STURANY, in : BAUMANN, *Durch Massailand zur Nilquelle*, Berlin, p. 3.
1897. *Planorbis sudanicus* MARTENS, *Beschalte Weichthiere Deutsch-Ost-Afrik.*, Berlin, p. 146 : taf. i, fig. 17.
1907. *Planorbis sudanicus* GERMAIN, *Mollusques terr. fluvial. Afrique Centrale française*, Paris, p. 504.
1909. *Planorbis sudanicus* THIELE, *Mollusk. d. deutschen Zentralafrika-Expedition, Wissenschaftl. Ergebn. d. deutschen Zentral-Afrika-Exped. 1907-1908*, Leipzig, III, p. 209.
1911. *Planorbis sudanicus* GERMAIN, *Notice Malacologique, Documents scientifiques Mission TILHO*, II, Paris, p. 187.
1914. *Planorbis (Coretus) sudanicus* DAUTZENBERG et GERMAIN, *Revue Zoologique africaine*, IV, fasc. I, Bruxelles, p. 40.
1916. *Planorbis (Coretus) sudanicus* GERMAIN, *Bulletin Muséum Hist. natur.*, XXII, No. 4, p. 195.

LOCALITÉ.

Afrique orientale : La Tanganika ; un exemplaire ; No. 103 A.

¹ J'ai figuré un de ces exemplaires [GERMAIN (LOUIS), *loc. supra cit.*, Bordeaux, 1910, pl. i, fig. 13—14].

² MORELET (A.), *loc. supra cit.*, 1868, p. 85.

DISTRIBUTION GÉOGRAPHIQUE.

Ce *Planorbe* est répandu dans toutes les parties orientales et centrales de l'Afrique tropicale : région des grands lacs (Victoria-Nyanza [C. ALLUAUD, F. STUHLMANN], lac Manyara [O. BAUMANN, O. NEUMANN], lac Albert Edward [F. STUHLMANN], lac Albert [BAKER, EMIN PACHA], lac Tanganyika [O. BAUMANN, V. GIRAUD, E. COODE HORE, E. STORMS, etc....], etc....); Congo belge (Haut Congo, près de Bukama [DR. J. BEQUAERT]); Bassin du Chari [A. CHEVALIER, DR. DECORSE]; région du lac Tchad [A. CHEVALIER, R. CHUDEAU, DR. DECORSE, G. GARDE, Colonel TILHO, etc....].

Le *Planorbis* (*Planorbis*) *sudanicensis* Martens montre, dans sa forme générale et son enroulement, quelques analogies avec les *Planorbes* sudaméricains appartenant au groupe du *Planorbis* (*Planorbina*) *guadalupensis* Sowerby.¹ Il varie considérablement de taille : les plus petits exemplaires appartiennent à la variété *minor* Martens² et n'ont que 9—11 millimètres de diamètre maximum pour 3½ millimètres de hauteur ; les très grands individus, atteignant jusqu'à 22 millimètres de diamètre maximum, rentrent dans la variété *magnus* Sturany.³ La variété de grande taille semble particulièrement répandue dans le bassin du Chari.

Planorbis (*Planorbis*) *adowensis* Bourguignat.

- 1879. *Planorbis adowensis* BOURGUIGNAT, *Descript. espèces nouv. Mollusques Egypte, Abyssinie, Zanzibar*, etc. . ., Paris, p. 11.
- 1883. *Planorbis adowensis* BOURGUIGNAT, *Histoire malacologique Abyssinie*, Paris, p. 101 et p. 128 ; et *Annales sciences naturelles, Zoologie*, 6^e série, XV, p. 101 et p. 128.
- 1888. *Planorbis adowensis* BOURGUIGNAT, *Iconographie malacologique lac Tanganika*, Corbeil, pl. i, fig. 1 à 4.
- 1890. *Planorbis adowensis* BOURGUIGNAT, *Histoire malacologique lac Tanganika*, Paris, I, p. 17, pl. i, fig. 1—4 ; et *Annales Sciences naturelles, Zoologie*, 7^e série, X, même pagination.
- 1897. *Planorbis adowensis* MARTENS, *Beschalte Weichthiere Deutsch-Ost-Afrik.*, Berlin, p. 147.
- 1898. *Planorbis Herbini* var. *adowensis* POLLONERA, *Bollett. Musei Anatomia compar.* . . Torino, XIII, 4 Mars 1898, p. 11.
- 1904. *Planorbis adowensis* SMITH, *Proceedings Malacological Society of London*, VI, part 2, p. 98.
- 1904—1905. *Planorbis adowensis* GERMAIN, *Bulletin Muséum Hist. natur.* Paris, X, p. 350 et XI (1905), p. 252.
- 1907. *Planorbis adowensis* GERMAIN, *Mollusques Afrique centrale française*, Paris, p. 507.

¹ Cette remarque a tout d'abord été faite par le DR. E. von MARTENS (*Beschalte Weichthiere Deutsch-Ost-Afrik.*, Berlin, 1897, p. 147). J'ajouterai qu'une ressemblance identique existe entre le *Planorbis* (*Planorbis*) *Bridouxii* Bourguignat, d'Afrique et les *Planorbes* sud-américains de la série du *Planorbis* (*Pierosoma*) *peruvianensis* Broderip.

² MARTENS (DR. E. von), *loc. supra cit.*, 1897, p. 146.

³ STURANY (R.), *Mollusk.*, in : BAUMANN (O.), *Durch Massailand zur Nilquelle*, Berlin, 1896, p. 14, taf. i, fig. 10, 14 et 29.

LOCALITÉ :

Abyssinie : Antalo [W. T. BLANFORD].

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe, répandu dans un grand nombre de localités africaines, n'est nulle part très commun. Il vit surtout en Abyssinie, mais se retrouve, au nord, dans l'Erythrée italienne [général DE BOCCARD], à l'ouest, dans une grande partie du Bassin du Chari [A. CHEVALIER, DR. DECORSE] et, au sud, jusqu'au lac Tanganyika.

La *Planorbis adowensis* Bourguignat est certainement voisin du *Planorbis Rüppelli* Dunker, mais il est constamment plus épais proportionnellement à son diamètre maximum et sa spire croît beaucoup plus rapidement, le dernier tour formant, en dessus, presque toute la coquille. La taille permet de distinguer des variétés *minor* (un tiers plus petite que le type) et *major*, cette dernière atteignant 13—15 millimètres de diamètre maximum.¹

§ IV.

Planorbis (Planorbis) Bridouxi Bourguignat.

- 1888. *Planorbis Bridouxianus* BOURGUIGNAT, *Iconographie malacologique lac Tanganika*, Corbeil, pl. i, fig. 9 à 12.
- 1890. *Planorbis Bridouxianus* BOURGUIGNAT, *Histoire malacologique lac Tanganika*, Paris, p. 20, pl. i, fig. 9 à 12, et : *Annales Sciences naturelles, Zoologie*, 7^e série, X, même paginat.
- 1897. *Planorbis Bridouxianus* MARTENS, *Beschaltte Weichthiere Deutsch-Ost-Afrik.*, Berlin, p. 147.
- 1904. *Planorbis Bidouxianus* SMITH, *Proceedings Malacological Society of London*, IV, part II, p. 98.
- 1904—1905. *Planorbis Bridouxi* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, X, No. 6, p. 349—390; et : XI, No. 4 (1905), p. 253 et p. 256.
- 1907. *Planorbis Bridouxi* GERMAIN, *Mollusques terr. et fluviat. Afrique Centrale française*, Paris, p. 509.
- 1908. *Planorbis Bridouxi* NEUVILLE et ANTHONY, *Annales sciences natur.*, VIII, p. 253, fig. 2.
- 1909. *Planorbis Bridouxi* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XV, p. 374.
- 1909. *Planorbis Bridouxi* SMITH, *Transactions of the Zoological Society of London*, XIX, p. 47, No. 14.
- 1910. *Planorbis Bridouxi* GERMAIN, *Actes société linnéenne Bordeaux*, LXIV, p. 39, pl. i, fig. 11—12, 17 et 18.
- 1911. *Planorbis Bridouxi* GERMAIN, *Notice Malacologique*, in : *Documents Scientifiques Mission TILHO*, II, Paris, p. 189, pl. i, fig. 20 à 22, et pl. ii, fig. 1 à 4, et p. 231.
- 1916. *Planorbis (Coretus) Bridouxi* GERMAIN, *Seconde Notice malacologique*, in : *Documents scientifiques Mission TILHO*, III, Paris, p. 299.

¹ Pour l'étude de la variation chez cette espèce, cf. : GERMAIN (LOUIS), *Les Mollusques terrestres et fluviatiles de l'Afrique Centrale française*, in : CHEVALIER (A.), *L'Afrique Centrale française*, Paris, 1907, pp. 508-09.

LOCALITÉ:

Abyssinie: Rivière Undul [Coll. W. T. BLANFORD].

DISTRIBUTION GÉOGRAPHIQUE.

Espèce très répandue dans l'Afrique tropicale, le *Planorbis Bridouxii* Bourguignat a été observé depuis le Nil jusqu'au Sénégal et en Mauritanie [A. GRUVEL et R. CHUDEAU]. Il est commun dans le Chari [A. CHEVALIER], le Tchad et le Niger [R. CHUDEAU]. Il vit également en Abyssinie (H. NEUVILLE et M. DE ROTHSCILD), dans la région des grands lacs (Victoria-Nyanza, Tanganyika, etc. . .) et jusque dans les étangs des pentes du Ruwenzori [E. A. SMITH]. Mais c'est certainement dans le lac Tchad et les contrées voisines qu'il est le plus abondant et où il a été recueilli par le plus grand nombre de voyageurs. [Lieutenant de Vaisseau AUDOIN, A. CHEVALIER, R. CHUDEAU, Lieutenant FERRANDI, Mission FOUREAU-LAMY, G. GARDE, Lieutenant LACONIN, Colonel TILHO, etc. . .].

Le *Planorbis Bridouxii* Bourguignat est une des espèces les plus caractéristiques du centre africain. Sauf en ce qui concerne la taille, il reste bien constant dans le bassin du lac Tchad mais montre, dans les régions occidentales de l'Afrique, un polymorphisme étendu que j'ai précédemment étudié.¹

La taille oscille entre 6 et 12 millimètres de diamètre maximum, 4 et 10 millimètres de diamètre minimum et 3 et 4½ millimètres de hauteur [= épaisseur]. Mais il existe une variété *major* Germain,² qui ne vit guère que dans le lac Tchad, et atteignant 14½ millimètres de diamètre maximum, 10½ millimètres de diamètre minimum et 4½ millimètres de hauteur [= épaisseur] maximum.

Les exemplaires du Musée de Calcutta sont des jeunes. C'est dire que leur coquille est très épaisse par rapport au diamètre maximum, la hauteur [= épaisseur] du *Planorbis Bridouxii* Bourguignat étant d'autant plus faible que l'animal a atteint un développement plus complet.

§ V.

***Planorbis (Planorbis) exustus* Deshayes.³**

Pl. I, fig. 4 à 9; Pl. IV, fig. 11, 17 et 18, et fig. 1 à 11, 13 à 16, dans le texte.

1774. *Planorbis purpura junioire et littore Coromandelico* MÜLLER, *Verm. terr. et fluviat. Hist.*, II, Lipsiac, p. 157.

1786. *Helix cornea Linnaei*, variété, CHEMNITZ, *Systemat. Conchylien-Cabinet*, IX, p. 96, taf. cxxvii, fig. 1116—1117.

¹ GERMAIN (LOUIS), Sur quelques Mollusques terr. et fluvi. rapportés par CH. GRAVIER du désert Somali, *Bulletin Muséum Hist. natur. Paris*, X, 1904, No. 6, p. 349; et: Etude Mollusques terr. et fluviat. mission délimitation Niger-Tchad (Mission TILHO), *Documents scientifiques Mission TILHO*, Paris. Imprim. nation., II, 1911, p. 180.

² GERMAIN (LOUIS), *loc. supra cit.*, 1904, p. 351 (note 2): et: *loc. supra cit.*, 1911, p. 190, pl. i, fig. 22.

³ Alors que ce Mémoire était déposé, des recherches anatomiques ont conduit M. N. ANNANDALE à instituer, pour le *Planorbis exustus* Deshayes, le nouveau genre

1834. *Planorbis corneus*? HUTTON, *Journal Asiatic Society of Bengal*, III, p. 90.
1834. *Planorbis exustus* DESHAYES, *Voyage Bélanger Indes Orientales, Zoologie*, p. 417, pl. i, fig. 11 à 13.
1836. *Planorbis Indicus* BENSON, *Journal Asiatic Society of Bengal*, V, p. 743.
1836. *Planorbis exustus* MÜLLER, *Synopsis nov. gener. Testaceor. vivent.*, Berolini, p. 34.
1838. *Planorbis exustus* DE LAMARCK, *Hist. natur. animaux sans vertèbres*, Edit. 2 [par G. P. DESHAYES], VIII, Paris, p. 392, No. 17.
1855. *Planorbis brunneus* GRAY, in: ADAMS, *Genera of recent Mollusca*, II, p. 261 [non LISTER].
1856. *Planorbis Coromandelicus* DUNKER, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 43, No. 9, taf. vi, fig. 14 à 16 et 20 à 22 [non O. FABRICIUS].
1856. *Planorbis zebrinus* DUNKER, *loc. supra cit.*, p. 57, No. 25, taf. vi, fig. 11 à 13.
1860. *Planorbis coromandelicus* MARTENS, *Proceedings Zoological Society of London*, p. 12.
1862. *Planorbis circumspissus* MORELET, *Revue et Magasin de Zoologie*, p. 477.
1863. *Planorbis circumspissus* CROSSE et FISCHER, *Journal de Conchyliologie*, XI, p. 362.
1867. *Planorbis indicus* MARTENS, *Malakozoolog. Blätter* XIV, p. 212.
1871. *Planorbis circumspissus* MABILLE, *Revue et Magasin de Zoologie*, XXIII, p. 50.
1875. *Planorbis exustus* MORELET, *Séries Conchyliologiques*, IV, Indochine, Paris, p. 274, No. 41.
1876. *Planorbis exustus* CROSSE et FISCHER, *Journal de Conchyliologie*, XXIV, p. 315.
1876. *Planorbis zebrinus* HANLEY et THEOBALD, *Conchologia Indica*, London, p. XVIII.
1876. *Planorbis exustus* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 18, pl. xxxix, fig. 10 et pl. xl, fig. 1.
1876. *Planorbis Merguiensis* PHILIPPI, in: HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii, et p. 60, pl. cli, fig. 5—6.
1878. *Planorbis exustus* SOWERBY, *Monograph of the genus Planorbis*, in: I. REEVE, *Conchologia Iconica*, XX, London, pl. iv, fig. 31.
1878. *Planorbis Coromandelicus* SOWERBY, *loc. supra cit.*, XX, pl. iv, fig. 34.
1878. *Planorbis eburneus* SOWERBY, *loc. supra cit.*, XX, pl. v, fig. 38a, 38b, 38c.
1878. *Planorbis brunneus* SOWERBY, *loc. supra cit.*, XX, pl. v, fig. 40a, 40b.
1878. *Planorbis Merguiensis* SOWERBY, *loc. supra cit.*, XX, pl. xi, fig. 85.
1878. *Planorbis exustus* NEVILL, *Handlist Mollusca Indian Museum, Calcutta*, I, p. 241, No. 10.
1886. *Planorbis indicus* CLESSIN, *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., Nürnberg, XVII, p. 116, No. 83, taf. xvii, fig. 1—2.
1886. *Planorbis conatus* DUNKER, in: CLESSIN, *loc. supra cit.*, p. 116, taf. xvii, fig. 1.
1886. *Planorbis Merguiensis* CLESSIN, *loc. supra cit.*, p. 140, No. 117, taf. xii, fig. 26 à 28 et taf. xx, fig. 4.

Indoplanorbis. Ne voulant pas changer la pagination de mon travail je reviendrai sur cette question dans un appendice qui paraîtra avec le dernier fascicule.

¹ HANLEY (S.) et THEOBALD (W.) [*Conchologia Indica: illustrations of the Land and Freshwater Shells of British India*, London, 1876, p. 60] disent qu'ils ont reçu le spécimen figuré pl. CLI, fig. 5—9 sous le nom de *Planorbis Merguiensis* Philippi, mais qu'ils n'ont pas trouvé la publication où R. PHILIPPI a décrit ce Planorbe.

1886. *Planorbis brunneus* CLESSIN, *loc. supra cit.*, p. 226, No. 249.
 1886. *Planorbis eburneus* CLESSIN, *loc. supra cit.*, p. 226, No. 250.
 1889. *Planorbis exustus* MORLET, *Journal de Conchyliologie*, XXXVII, p. 130.
 1891. *Planorbis exustus* MORLET, *Journal de Conchyliologie*, XXXIX, p. 233.
 1891. *Planorbis exustus* FISCHER, *Bull. soc. Hist. natur. Autun*, p. 126.
 1903. *Planorbis exustus* BLANFORD, *Proceed. Malacological Society of London*, p. 280.
 1904. *Planorbis exustus* FISCHER et DAUTZENBERG, *Catalogue Mollusques Indo-Chine*, in: *Mission Pavie*, p. 414.
 1905. *Planorbis exustus* DAUTZENBERG et FISCHER, *Journal de Conchyliologie*, LII, p. 381.
 1910. *Planorbis exustus* BAVAY et DAUTZENBERG, *Journal de Conchyliologie*, LVIII, p. 18.
 1915. *Planorbis exustus* PRESTON, *Fauna of British India: Mollusca [Freshwater Gaster. and Pelecypoda]*, London, p. 115, No. 227.
 1915. *Planorbis exustus* var. *eburneus* PRESTON, *loc. supra cit.*, p. 116.
 1915. *Planorbis exustus* var. *brunneus* PRESTON, *loc. supra cit.*, p. 116.
 1915. *Planorbis exustus* var. *zonatus* PRESTON, *loc. supra cit.*, p. 116.
 1915. *Planorbis zebrinus* PRESTON, *loc. supra cit.*, p. 116, No. 228.
 1915. *Planorbis merguensis* PRESTON, *loc. supra cit.*, p. 118, No. 232.
 1918. *Planorbis exustus* ANNANDALE, *Records of the Indian Museum*, Calcutta, XIV, p. 111, pl. xi, fig. 1, 1a.
 1919. *Planorbis exustus* ANNANDALE, *Records of the Indian Museum*, Calcutta, XVI, p. 145.

LOCALITÉS :

*Indes anglaises*¹ Bangalore [H. F. BLANFORD]; 15 exemplaires ;= Bhamô [DR. J. ANDERSON]; 10 exemplaires ;= Belgatchia, Calcutta [DR. N. ANNANDALE]; 1 exemplaire ;²= Bombay [Rev. S. B. FAIRBANK]; 6 exemplaires ;= Calcutta [DR. J. BAXTER]; 10 exemplaires ;= Calcutta (Museum tank of) [J. CANNTER]; 22 Avril 1907, 1 exemplaire ;= Calcutta, Maidan tank [DR. N. ANNANDALE]; un exemplaire très jeune ;= Port Canning, Gangetic delta [Colonel G. B. MAINWARING et G. NEVILL]; 10 exemplaires ;= Port Canning, dans les marais saumâtres [R. HODGART], 8 exemplaires ;³= Damotha (inland from Moulmein) [DR. F. STOLICZKA]; 18 exemplaires ;⁴= Damukdia Ghat, East Bengal [DR. N. ANNANDALE]; 22 Juillet 1907, 18 exemplaires ;= Ernakulam, Cochin State, Malabar [DR. N. ANNANDALE], 5 Novembre 1908, nombreux exemplaires, No. M^{1,2,3,4} ;= Gauhati [= Gowhatty] (Assam), 10 exemplaires⁵ ; Gopkuda

¹ Pour faciliter les recherches, les localités sont ici classées par ordre alphabétique.

² Un exemplaire de taille moyenne, relativement aplati, avec un test *corné verdâtre* plus clair en dessous. La sculpture est délicate: elle se compose de stries longitudinales fines, bien obliques, serrées et subégales.

³ Exemplaires normaux, malgré leur vie dans l'eau saumâtre. Le test de certains individus est, cependant, un peu épaissi, mais ce caractère est moins net que chez beaucoup d'exemplaires ayant vécu dans des eaux absolument douces.

⁴ Forme à peu près normale. Un individu [No. E. 11 du tableau suivant, p. 31] a un test solide, un peu épais, avec une ouverture garnie d'un bourrelet interne.

⁵ Forme d'assez grande taille (Voir le tableau, p. 32, nos L. 52, 53, 54). Le test est d'un corné jaunacé un peu verdâtre; l'ouverture est munie d'un bourrelet interne blanc bien marqué. La sculpture, très irrégulière, montre de grosses côtes distribuées sans ordre, comme chez le *Planorbis* (*Planorbis*) *adelosius* Bourguignat.

Island, lac Chilka (Madras) [DR. N. ANNANDALE]; 7—15 Août 1907; 2 exemplaires; ¹=Hazrapoor; 1 exemplaire;=Indore (West of), Central India [W. T. BLANFORD]; 2 exemplaires;=Ferozepore, Punjab; nombreux exemplaires; ²=Kawkareik (Lac de), Amherst District (Tenasserim) [DR. N. ANNANDALE]; 5 Mars 1908; un exemplaire; No. 1. M. 5;=Katiawar [J. WALLACE]; deux exemplaires (dont un déformé), No. M. $\frac{4005}{1}$ + nombreux exemplaires, No. M. $\frac{4097}{1}$;=Kerumaadi, extrémité sud du lac Vembanaad, Travancore [DR. N. ANNANDALE]; 6 Novembre 1908; 14 exemplaires; No. M. $\frac{4260}{1}$;=Kulu, W. Himalayas; 16 exemplaires ³+ 18 exemplaires; ¹⁰=Madras [G. NEVILL]; 10 exemplaires; ⁴=Madras [DR. N. ANNANDALE]; 31 Décembre 1908; nombreux exemplaires; No. M. $\frac{4256}{1}$;=Manbhum, Bengal [V. BALL]; 6 exemplaires; ⁶=Mandalay [DR. J. ANDERSON]; 10 exemplaires;=Mandalay (U. Burma) [DR. N. ANNANDALE]; 12 Mars 1908; 1 exemplaire + 12 exemplaires; Mandalay (City Moat) [J. COGGIN BROWN]; Janvier 1907; 1 exemplaire;=Mandoo, Central India; 3 exemplaires;=Moradabad, United Provinces; 2 exemplaires;=Mussoorie [Collect. *Asiatic Society of Bengal*]; 4 exemplaires;=Patna, Bihar (Colonel G. B. MAINWARING); deux exemplaires; ⁶=Pégu; 5 exemplaires;=Puri [=Pooree] [H. RABAN]; 2 exemplaires; ⁷=Puri (Orissa Coast) [DR. N. ANNANDALE]; 24 Décembre 1908; 1 exemplaire No. M. $\frac{4201}{1}$ et 22 Décembre 1908; 10 exemplaires, No. M. $\frac{4262}{1}$;=Quilon, Travancore; 6 exemplaires + 7 exemplaires (No 21);=Rajmehal, Bengal [DR. T. OLDHAM et J. WOOD-MASON]; 8 exemplaires;=Rangoon (Burma) [DR. N. ANNANDALE]; No. 1. M. 6; 3 exemplaires;=Rangoon, Victoria Lake [J. COGGIN BROWN]; 6 exemplaires;=Rangoon, bed of dry pond [DR. N. ANNANDALE]; 26 Février 1908; 1 exemplaire;=Roorkee, United Provinces [J. WOOD-MASON]; 4 exemplaires;=Rudpur, Naini Tal District; 18 Mars 1908; 1 exemplaire;=Saharanpore, United Provinces; 2 exemplaires;=Samaguting (Assam); 10 exemplaires;=Salt Range,

¹ Test assez épais, solide, marron jaunâtre, ni transparent ni translucide; ouverture à peu près aussi haute que large, semi arrondie, garnie d'un fort bourrelet interne blanc ou roux.

² La coquille des individus de cette localité est relativement aplatie avec une spire à enroulement assez lent. Leur sculpture montre, aussi bien en dessus qu'en dessous, de très grosses côtes rayonnantes (fig. 6, 7, 8, dans le texte).

³ Etiquetés: *Planorbis exustus* var. *contorta*.

⁴ Etiquetés: *Planorbis exustus* var. *nana*. (Ce sont des individus jeunes; voir plus loin, p. 40, l'étude des formes jeunes).

⁵ Coquille de grande taille (Voir Nos. A. 1, 2, 3, du tableau suivant, p. 31) très aplatie; spire à enroulement lent avec un dernier tour très grand, plus élargi en dessous qu'en dessus; test très irrégulièrement garni de stries fines obliques, quelques unes fortes et lamelleuses. Cette forme correspond peut être au *Planorbis coromandelicus* de FABRICIUS.

⁶ Coquille normale, mais avec sculpture très inégale présentant de grosses côtes au dernier tour.

⁷ Deux exemplaires de petite taille (voir les Nos. M. 55, 56, du tableau suivant, p. 32), très remarquables par leur forme élevée et leur ouverture subtriangulaire avec un péristome légèrement réfléchi, intérieurement bordé d'un bourrelet blanc rosé bien marqué. Le test est d'un fauve rouge assez vif et l'intérieur de l'ouverture lie de vin. La sculpture est irrégulière (stries longitudinales très obliques, tout à fait inégales).

Punjab [W. THEOBALD]; 3 exemplaires; ¹=Shencottah, Madras frontier (E. side of W. Ghats, Travancore [DR. N. ANNANDALE]; 25 Novembre 1908; 7 exemplaires; No. M. ²_{1.5.1}; =Shasthancottah, 12 miles N.N.E. of Quilon, Travancore [DR. N. ANNANDALE]; 8 Novembre 1908; 6 exemplaires très jeunes, No. M. ³_{1.5.2}; =Silcuri, Cachar (Assam); 16 exemplaires; =Sur Lake, Puri District, Orissa, 23 Décembre 1908 [DR. N. ANNANDALE]; No. M. ⁴_{1.5.3}; 15 exemplaires.⁵

Plaines de l'Inde, sans localité précise [Collect. *Asiatic Society of Bengal*]; l'Inde, sans localité précise [4 grands exemplaires + 9 grands exemplaires + 7 exemplaires + 4 exemplaires adultes et 3 jeunes + 12 exemplaires adultes + 1 exemplaire adulte et 8 jeunes + 4 grands exemplaires + 6 exemplaires adultes + 2 exemplaires de grande taille + 4 exemplaires.⁶

Ile de Ceylon : Balapiti [G. NEVILL]; 10 exemplaires; =Kandy [H. F. BLANFORD]; 10 exemplaires; =Tamankandua [F. I. LAYARD]; 2 exemplaires.

Péninsule Malaise : Quala Kangsa, Perak [DR. E. TOWNSEND, ex. c. G. NEVILL]; 5 exemplaires.

Cochinchine : Sans localité précise [A. MORELET]; 5 exemplaires.⁷

Perse Orientale : Gwádar, Persian Baluchistan [W. T. BLANFORD]; 20 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis* (*Planorbis*) *exustus* Deshayes vit dans toute l'Asie méridionale, depuis les limites occidentales de l'Inde jusqu'en Indochine.

Représentant, dans l'Asie Oriento-méridionale, le *Planorbis* (*Pierosoma*) *trivolvus* Say de l'Amérique du Nord et le *Planorbis* (*Planorbis*) *corneus* Linné des eaux douces européennes, le *Planorbis* (*Planorbis*) *exustus* Deshayes est aussi variable que ces deux derniers. A. MORELET, qui a étudié de nombreux Mollusques asiatiques, a déjà fait remarquer ce polymorphisme, mais sans l'étudier d'une manière suffisamment approfondie. Il est, dit-il "... assez variable dans le mode d'enroulement de la spire, dont le premier tour, tautôt est en évidence, et tantôt enveloppé par le suivant ... sa forme, dans l'Indo-Chine, offre plus de régularité qu'ailleurs, et sa coloration, au lieu d'être uniforme, se rembrunit

¹ Individus subfossiles au test relativement épais et solide.

² Individus de coloration très variable, depuis le corné clair jusqu'au fauve presque rouge et au marron verdâtre.

³ Dont un très grand (diamètre maximum : 24 millimètres; diamètre minimum : 20½ millimètres; hauteur : 10½ millimètres; diamètre de l'ouverture : 10 millimètres; hauteur de l'ouverture : 11 millimètres), fortement aplati, avec un test très clair, corné presque blanc, subtransparent. Ces 4 individus étaient étiquetés : *Planorbis indicus* var. *varicifera*.

⁴ Individus de petite taille (voir numéros W. 86 à 91 du tableau suivant, p. 33), remarquables par leur belle coloration rouge ou lie de vin. L'intérieur de l'ouverture est lie de vin clair. Le péristome est souvent bordé intérieurement d'un bourrelet blanc ou rosé très apparent. Le test est élégamment orné de stries costulées obliques, subégales, parfois plus ou moins onduleuses.

sensiblement à la périphérie. Les sujets les plus développés que je connaisse sont originaires de Ceylan et mesurent 17 millimètres de plus grand diamètre; les plus petits viennent du Birman et ne comptent que 13 millimètres (*Planorbis merguiensis* Phil.). . .¹

Le polymorphisme du *Planorbis* (*Planorbis*) *exustus* Deshayes porte tout à la fois sur les caractères de l'enroulement et de l'ouverture, sur la taille, sur la coloration, sur la manière d'être du test et sur la sculpture.

[a] TAILLE.

Elle varie dans des proportions considérables et le tableau suivant met ce polymorphisme en évidence.

Numéros des Echantillons.	Diamètre maximum.	Diamètre minimum.	Hauteur totale.	Diamètre de l'ouverture.	Hauteur de l'ouverture.	Localités.
A. 1 2 3	21½ mill. 21½ — 20½ —	18½ mill. 17 — 17 —	8½ mill. 8½ — 8½ —	8½ mill. 9½ — 9 —	9 mill. 8½ — 7½ —	Manbhum.
B. 4 5	16½ — 15½ —	14 — 13 —	9 — 7 —	8 — 6 —	8½ — 6 —	Calcutta.
C. 6 7 8	16½ — 14 — 13½ —	14½ — 12 — 11½ —	8½ — 7½ — 7½ —	8 — 7 — 7 —	8 — 7½ — 7½ —	Madras.
D. 9 10	14½ — 13 —	12 — 11 —	6½ — 6 —	7 — 6½ —	7½ — 6 —	Salt Range [Exemplaires subfossiles].
E. 11 12 13	15½ — 15 — 12½ —	12 — 13½ — 10 —	7½ — 7 — 6½ —	8 — 7½ — 6½ —	7½ — 7 — 6½ —	Damothe [= Moulmein].
F. 14 15 16 17	17 — 16 — 15½ — 12½ —	14 — 12½ — 13½ — 11½ —	8 — 6½ — 6½ — 5½ —	6 — 7 — 7 — 5 —	7½ — 7 — 6½ — 5 —	Rajmahal.
G. 18 19 20 21 22 23	18 — 18 — 17 — 15 — 14 — 14 —	14½ — 14½ — 14½ — 12½ — 12 — 11½ —	8½ — 6½ — 7 — 6 — 6 — 6½ —	8 — 7 — 7 — 7 — 6 — 6 —	9 — 6½ — 7 — 6 — 6 — 6½ —	Ferozepore.
H. 24	14 —	11½ —	6 —	5½ —	6 —	Belgatchia

¹ MORRELET (A.), *Séries Conchyliologiques*; IV, *Indo-Chine*, Paris, Avril 1875, p. 275.

Numéros des Echantillons.	Diamètre maximum.	Diamètre minimum.	Hauteur totale.	Diamètre de l'ouverture.	Hauteur de l'ouverture.	Localités.
I. 25	16 —	12½ —	7 —	6½ —	6 —	Quilon.
26	15½ —	12½ —	6½ —	7 —	5½ —	
27	14½ —	12½ —	6½ —	6½ —	6 —	
28	13½ —	11½ —	6 —	6 —	5½ —	
29	13½ —	11½ —	6½ —	7 —	6½ —	
30	10 —	9 —	5 —	4½ —	4½ —	
31	9½ —	8 —	4½ —	4 —	4½ —	
J. 32	16 mill.	12½ mill.	7 mill.	7 mill.	7 mill.	Kulu.
33	15½ —	12½ —	6½ —	6 —	6 —	
34	15 —	12 —	6 —	6 —	5½ —	
35	14½ —	13 —	6 —	6½ —	6 —	
36	14½ —	12½ —	6 —	6 —	6 —	
37	13 —	10½ —	6 —	6 —	6 —	
38	13 —	10½ —	6 —	5 —	5 —	
39	12 —	10½ —	5½ —	5 —	5 —	
40	11½ —	9½ —	5½ —	5 —	5 —	
41	11½ —	9 —	5½ —	4½ —	4½ —	
42	11 —	9½ —	5 —	5 —	4½ —	
43	11 —	9½ —	5½ —	5 —	5 —	
44	11 —	9 —	5½ —	4½ —	4½ —	
45	9 —	8 —	5 —	4 —	4½ —	
K. 46	14½ —	12 —	7½ —	7 —	7½ —	Bhamô.
47	14½ —	11½ —	7 —	6½ —	7½ —	
48	13½ —	11½ —	7 —	6½ —	6½ —	
49	13½ —	10 —	7½ —	6 —	8½ —	
50	13 —	10 —	8 —	7½ —	8½ —	
51	10 —	8 —	6 —	5½ —	6 —	
L. 52	18½ —	14½ —	9 —	8 —	9 —	Gauhâti [= Gowhatty].
53	16½ —	14½ —	8½ —	7 —	7½ —	
54	16 —	14½ —	8½ —	7½ —	8 —	
M. 55	13 —	10 —	6½ —	6 —	7 —	Puri [= Pooree.]
56	12½ —	10 —	6½ —	6 —	7 —	
N. 57	18½ —	15 —	8½ —	8½ —	8½ —	Patna.
58	15 —	12½ —	8½ —	7½ —	8 —	
O. 59	17 —	13 —	7 —	7 —	7½ —	Victoria Lakes, Rangoon (Burma).
60	16 —	13 —	8 —	6½ —	8 —	
61	15½ —	13½ —	6½ —	7 —	6½ —	
P. 62	12½ —	11½ —	6½ —	5½ —	6 —	Lake Chilka.
63	12½ —	11 —	6½ —	6 —	5½ —	
Q. 64	13 —	10½ —	6 —	6½ —	5½ —	Sur Lake [Puri District, Orissa].
65	12 —	10½ —	6 —	5½ —	6 —	
66	11½ —	10 —	5½ —	4½ —	5½ —	
67	11½ —	10 —	6½ —	5½ —	6½ —	

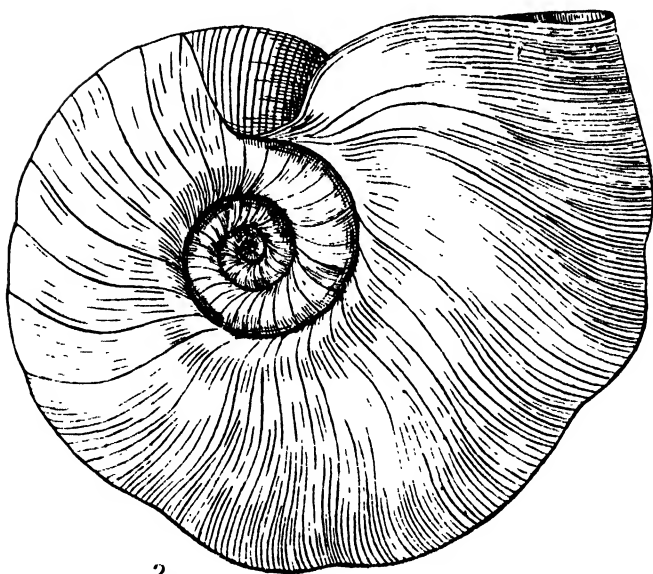
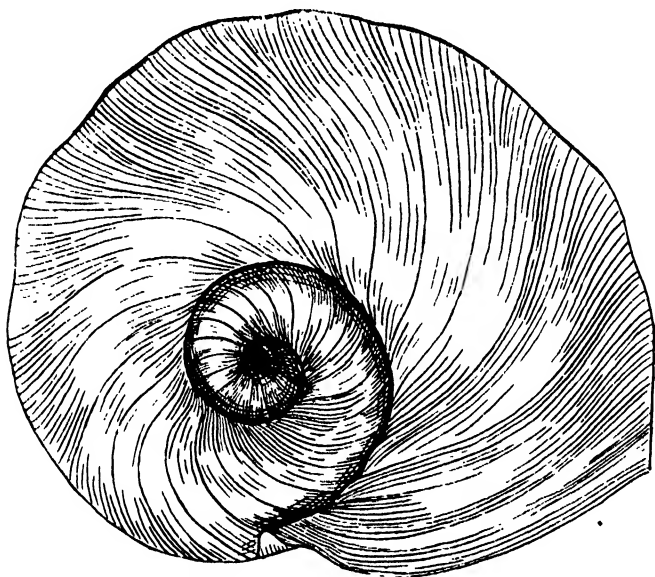
Numéros des Echantillons.	Diamètre maximum.	Diamètre minimum.	Hauteur totale.	Diamètre de l'ouverture.	Hauteur de l'ouverture.	Localités.
R. 68 69 70	24½ — 21 — 20½ —	20½ — 17 — 17½ —	10½ — 9 — 9½ —	10 — 9 — 8½ —	10½ — 9 — 9½ —	Inde, sans localité pré- cise
S. 71 72 73 74	18½ mill. 17½ — 16½ — 14 —	17 mill. 15 — 13½ — 12½ —	9½ mill. 8½ — 8 — 7½ —	8 mill. 8 — 7 — 6½ —	8½ mill. 8½ — 7½ — 7 —	Samaguting (Assam).
T. 75 76 77 78	14½ — 12½ — 11½ — 10 —	11½ — 10 — 9½ — 9 —	6½ — 5½ — 4½ — 5 —	6 — 5½ — 5 — 4 —	6 — 5½ — 4 — 5 —	Port Canning (dans les eaux saumâtres).
U. 79 80	20½ — 17½ —	16½ — 14 —	11½ — 10½ —	11 — 9½ —	12½ — 10 —	Tamankandua (Ceylon).
V. 81 82 83 84 85	15½ — 15½ — 15 — 13 — 13 —	12½ — 12 — 12 — 11 — 10½ —	6½ — 6½ — 8 — 6 — 6½ —	8 — 7 — 7 — 6½ — 6 —	6½ — 6 — 7½ — 6 — 6 —	Kandy (Ceylon).
W. 86 87 88 89 90 91	13 — 12½ — 11½ — 10½ — 10 — 9 —	11 — 10½ — 10 — 8½ — 8½ — 7½ —	6½ — 6 — 6½ — 5½ — 5½ — 5½ —	6 — 6 — 5 — 5 — 4½ — 4 —	6 — 5½ — 6 — 5 — 5 — 4½ —	Cochinchine (sans localité précise).

Ainsi les plus grands individus atteignent jusqu' à 24½ milli-
mètres de diamètre maximum (R. 68¹) tandis qu'il existe des
exemplaires, d'ailleurs parfaitement adultes, ne dépassant pas 11½
et même 11 millimètres de diamètre maximum (J. 40 à 44). Ces
derniers ont parfois été désignés sous le nom de variété *nana*. En
général, leur forme est régulière et les individus sont bien sembla-
bles entre eux comme taille et comme caractères. Leur test est
assez solide, corné roux enlever cette tache rplus ou moins foncé,
très légalement orné de stries longitudinales assez fines devenant
sublamelleuses sur la moitié aperturale du dernier tour. L'ouver-
ture est semi ovale, à peine aussi haute que large et munie
d'un bourrelet interne. Mais, le plus souvent, sous le nom de
variété *nana*, il a été groupé des formes *non encore adultes* du
Planorbis (*Planorbis*) *exustus* Deshayes.

¹ Ces numéros, ainsi que ceux qui suivent, se rapportent au tableau des pages
précédentes.

[β] SPIRE ET OUVERTURE.

Chez le *Planorbis* (*Planorbis*) *exustus* Deshayes typique, la coquille est relativement épaisse et l'enroulement est assez rapide, le dernier tour étant toujours plus ou moins dilaté. Mais il existe



2.

FIG. 1 et 2.—*Planorbis* (*Planorbis*) *exustus* Deshayes.
Forme du Tamankandua (île de Ceylon); $\times 5$ environ.

des individus beaucoup plus aplatis, à enroulement *lent et régulier* dont le dernier tour, aussi bien en dessus qu'en dessous, est à

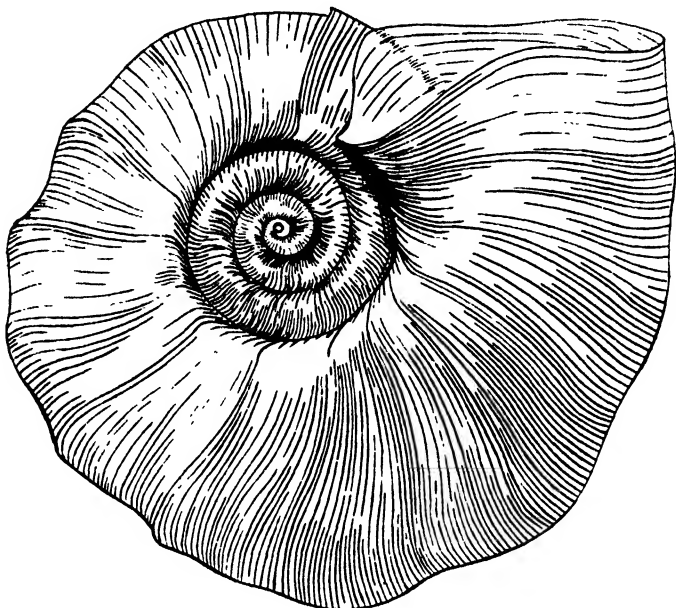


FIG. 3.—*Planorbis (Planorbis) exustus* Deshayes.
Forme de Tamankandua (île de Ceylon): $\times 5$ environ.

peine dilaté à l'extrémité. Cette forme se rencontre principalement chez les échantillons de taille grande ou moyenne : tel est le

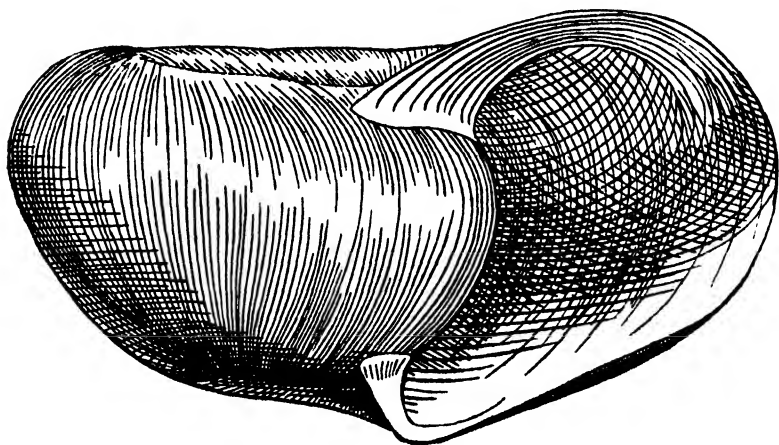


FIG. 4.—*Planorbis (Planorbis) exustus* Deshayes.
Forme de Tamankandua (île de Ceylon). Coquille vue du côté de l'ouverture; $\times 6$ environ.

cas de ceux recueillis à Rajmahal (F. 14, 15, 16), à Kulu (J. 32, 33, 34) et surtout à Manbhum (A. 1, 2, 3).

Parfois, la rapidité de l'enroulement s'accroissant, le dernier tour devient proportionnellement très grand et, en même temps,

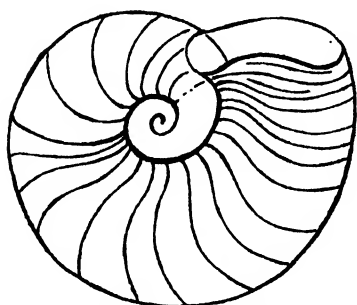


FIG. 5.—*Planorbis (Planorbis) exustus*
Deshayes.

Ile de Ceylon $\times 2\frac{1}{2}$ environ.

la forme de l'ouverture se modifie complètement. Ces caractères atteignent leur maximum d'amplitude chez les individus recueillis à Tamankandua, dans l'île de Ceylon (U. 79, 80) et répondant à la description suivante :

Coquille relativement très haute ; spire à enroulement très rapide ; dernier tour très dilaté, principalement en dessous ; ouverture obliquement subtriangulaire, très anguleuse et étroite à la

base, rappelant celle des *Planorbis* américains du sous-genre *Pierosoma* et, notamment, celle du *Planorbis (Pierosoma) ammon* Gould. Test assez épais, un peu solide, d'un brun roux plus clair en dessous qu'en dessus, très obliquement et très irrégulièrement strié. En dessous, la spire est étroite, limitée par la carène émoussée du dernier tour qui forme presque toute la coquille (fig. 1 à 5, dans le texte).

Mais, entre cette forme—si remarquable qu'elle semble constituer une espèce différente—et le type il est possible de retrouver tous les intermédiaires. Parmi les spécimens recueillis à Bhamô (K. 46 à 51) il en est qui se rapprochent beaucoup de ceux de Ceylon : le dernier tour est également très dilaté—principalement en dessous—et l'ouverture, fortement oblique, subtriangulaire, très développée en hauteur. Chez l'un d'entre eux (K. 49) cette ouverture présente même un péristome nettement réfléchi, très encrassé en dedans, si bien qu'il existe un véritable bourrelet interne blanchâtre.¹ Fache à enlever Un callus blanc grisâtre bien développé réunit, de plus, les deux bords de l'ouverture.

D'autres spécimens, provenant de Kandy dans l'île de Ceylon (V. 81 à 85), sont exactement intermédiaires entre la forme précédente et le type normal.

Signalons enfin un individu recueilli à Kulu (J. 38) dont le dernier tour montre un étranglement derrière son ouverture légèrement campanulée à la façon du *Planorbis (Planorbella) multivolvis* Case et du *Planorbis (Planorbella) campanulatus* Say. Il s'agit bien certainement d'un exemplaire anormal dont le test est, d'ailleurs, plus épais et plus solide que chez le type.

Ainsi, en résumé, la spire varie depuis un enroulement lent et régulier avec dernier tour médiocre, jusqu'à un enroulement très

¹ Ce bourrelet est situé le long de la ligne où se produit l'épanouissement du péristome.

rapide avec dernier tour très grand, parfois énorme, formant, en dessous, presque toute la coquille. En même temps l'ouverture, normalement ovale ou semilunaire, peut devenir subtriangulaire et, dans ce dernier cas, dépasser considérablement, en dessus, le plan du dernier tour.

[γ] COLORATION.

Le test est normalement corné roux ou fauve. La coloration peut s'accentuer et devenir, assez rarement, lie de vin ou même rouge. C'est le cas de nombreux individus provenant de Cochinchine (W. 86 à 91) dont l'intérieur de l'ouverture est lie de vin clair et qui, en outre, ont un péristome intérieurement bordé d'un bourrelet blanc ou rosé très apparent. Ce même coloris rougeâtre,

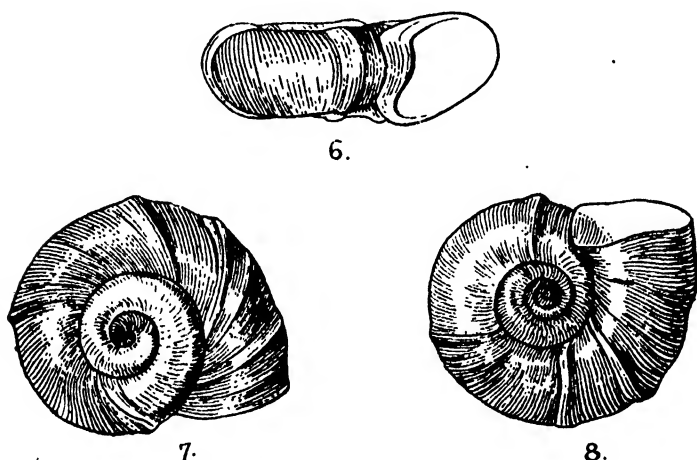


FIG. 6-7-8.—*Planorbis (Planorbis) exustus* Deshayes.
Variété *ex sculpta*. Indes [DR. N. ANNANDALE]; $\times 2$ environ.

parfois brillant existe aussi, mais moins accentué, chez les échantillons provenant des récoltes du Dr. N. ANNANDALE dans les Victoria Lakes (O. 59 à 61), Chilka Lake (P. 62, 63) et Sur Lake (Q. 64 à 67), ainsi que dans les spécimens provenant de Puri (M. 55, 56).

Parfois le test devient beaucoup plus clair. Rarement d'un corné verdâtre, comme à Belgatchia (H. 24), il est souvent d'un corné blond parfois très pâle, subtransparent (R. 68, 69, 70). Le terme extrême est atteint chez quelques individus de Gwadar¹ dont le test hyalin, absolument transparent, d'un blanc légèrement laiteux, laisse voir la columelle comme dans la variété *vitrinoides* ci après décrite.

¹ Ils sont de petite taille : 9—10 millimètres de diamètre maximum $7\frac{1}{2}$ —m, 8 millimètres de diamètre minimum et 4—5 millimètres de hauteur.

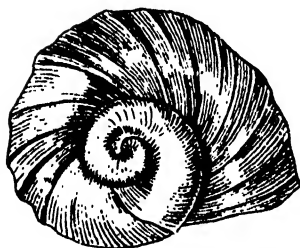
[δ] TEST ET SCULPTURE.

Plus ou moins épais, parfois mince et fragile, le test est, d'autres fois, solide et légèrement pondéreux. La sculpture comprend soit des stries longitudinales obliques, médiocres et plus accentuées vers l'ouverture, soit des stries lamelleuses plus ou moins fortes et presque régulières. Ces deux modalités se rencontrent d'ailleurs au sein d'une même colonie. Ainsi, parmi les exemplaires subfossiles recueillis à Quilon (I. 25 à 31) on observe :

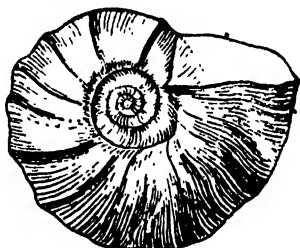
(a) des individus à test très finement orné de stries longitudinales obliques, subégales, légèrement plus accentuées vers l'ouverture ;



9.



10



11.

FIG. 9, 10, et 11.—*Planorbis (Planorbis) exustus* Deshayes.
Variété *ex sculpta*. Indes. [DR. N. ANNANDALE]; $\times 2$ environ.

(b) des exemplaires à test orné de stries presque régulières, à peu près égales, *subcostulées* aux premiers tours, devenant *costulées* et onduleuses au dernier tour.

Cette sculpture subcostulée ou même costulée n'est pas rare ; elle est, d'ailleurs toujours plus régulière que celle formée de simples stries longitudinales.¹

Mais, fort souvent, les stries ou costules sont très inégales, principalement au dernier tour. Par suite de l'accumulation, en certains points, de nombreuses stries longitudinales serrées les unes contre les autres il se produit, chez quelques individus, de très grosses côtes fort saillantes, disposées obliquement au dernier tour

¹ Comme exemple, citons les individus de Rajmahal (F. 14 à 17) : sculpture très régulière, composée de petites côtes obliques, un peu onduleuses, serrées et subégales.

et dont l'aspect rappelle tout à fait la coquille anormale de *Planorbis* (*Planorbis*) *corneus* Linné décrite, par J. R. BOURGUIGNAT, sous le nom de *Planorbis adelosius*. Je figure (Fig. 6 à 11, dans le texte) un exemple de cette anomalie assez fréquente dans de nombreuses localités de l'Inde : Samaguting (S. 71, 72), Gauhati [= Gowhatty] (L. 52, 53, 54), Ferozepore (G. 18, 20) etc. . . Enfin j'ai trouvé, dans la série de ce Planorbe appartenant au Musée de Calcutta, deux variétés nommées sans nom d'auteur et dont voici les descriptions :

Variété vitrinoides mss.

Planorbis exustus var. *vitrinoides* mss., in *Mus. Calcutta*.

Coquille d'un corné très clair, absolument transparente, hyaline, légèrement jaunâtre en dessus, blanche et un peu lactescente en dessous, assez brillante ; test mince et fragile garni, en dessus, de stries longitudinales très obliques, légèrement onduleuses, sub-égales et médiocres sauf sur la moitié aperturale du dernier tour où elles sont un peu subcostulées ; ¹ en dessous stries plus fines, beaucoup moins obliques et plus régulières.

Diamètre maximum : $14\frac{3}{4}$ millimètres ; diamètre minimum : $11\frac{1}{4}$ millimètres ; hauteur : 7 millimètres ; diamètre de l'ouverture : 6 millimètres ; hauteur de l'ouverture : 7 millimètres.

LOCALITÉ :

Inde : Aligarh (= Allyghur), U.P. [L. TAYLOR] ; un exemplaire.

Variété deformis mss.

Pl. IV, fig. 11, 17 et 18.

Planorbis exustus var. *deformis* mss., in *Mus. Calcutta*.

Coquille de taille médiocre, assez globuleuse ; spire montrant, en dessus, un enroulement rapide, ² mais normal, de *Planorbis exustus* Deshayes typique et, en dessous, des premiers tours serrés, à accroissement lent, étagés à la manière du *Planorbis* (*Planorbella*) *multivolvis* Case, de l'Amérique du Nord. avec un dernier tour grand, médiocrement dilaté à l'extrémité ; ouverture à peu près semilunaire avec bourrelet interne blanc.

Diamètre maximum : 9 millimètres ; diamètre minimum : 7 millimètres ; hauteur : $4\frac{1}{2}$ millimètres ; diamètre de l'ouverture : 4 millimètres ; hauteur de l'ouverture : 4 millimètres.

Test corné pâle, subtransparent, garni de fines stries obliques presque régulières, sauf sur la moitié aperturale du dernier tour où elles deviennent fortement obliques, un peu onduleuses, sub-égales et saillantes à la manière de petites côtes. (Fig. 11, 17 et 18, Planche IV).

¹ Ces costules apparaissent très nettement à l'intérieur de l'ouverture qui est bordée d'un péristome légèrement réfléchi.

² Les premiers tours sont très enfoncés et à peine visibles.

LOCALITÉ :

Inde: Harifeke; un exemplaire.

* * *

Le développement de la coquille du *Planorbis* (*Planorbis*) *exustus* Deshayes est tout à fait remarquable.

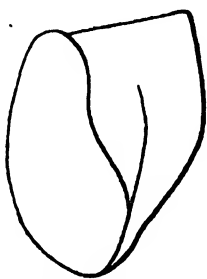


FIG 12.—*Physa planorbula* De Kay [= jeune du *Planorbis* (*Pierosoma*) *trivolvris* Say].

D'après G. W. BINNEY¹; $\times 5$ environ.

A un stade très jeune (longueur de 2 à 4 millimètres), la coquille ressemble tout à fait à une Physé (fig. 13, dans le texte). N. ANNANDALE² a, le premier, figuré cette forme jeune que j'avais observée depuis longtemps.³ A cet état de son développement, la coquille du *Planorbis* (*Planorbis*) *exustus* Deshayes rappelle, à s'y méprendre, le jeune du *Planorbis* (*Pierosoma*) *trivolvris* Say décrit par DE KAY⁴ sous le nom de *Physa planorbula* De Kay.⁵ (Fig. 12, dans le texte).

A un stade plus avancé la coquille, tout en conservant l'apparence d'une Physé, s'élargit notablement: elle devient plus globulense avec une ouverture moins étroite (Fig. 14, dans le texte). En même temps on voit apparaître, à la face supérieure, le premier tour de spire.⁶ Puis la coquille s'élargissant de plus en plus (Fig. 15, dans le texte) prend rapidement son aspect définitif de Planorbe, d'abord un peu globuleux (Fig. 16, dans le texte) puis nettement déprimé.

¹ BINNEY (G. W.), Land and Fresh Water Shells of North America, part II (Smithsonian Miscellaneous Collections, Vol. VII, No. 143. Washington, Septembre 1865), fig. 197 (page 118).

² ANNANDALE (N.), Aquatic Molluscs of the Inlé Lake and connected waters Records Indian Museum, XIV, Calcutta, 1918, pl. xi, fig. 1—1a.

³ Parmi les matériaux recueillis, par le DR. N. ANNANDALE lui-même, à Shanthacottah (12 miles N.N.E. of Quilon, Travancore), en Novembre 1908 (Indian Museum; No. M 4229).

⁴ KAY (DE), Zoology of New York, part V, Mollusca, 1843, p. 61, pl. iv, fig. 60—61.

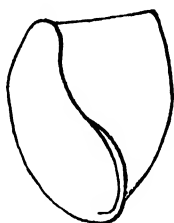
⁵ DE KAY a soupçonné que son espèce n'était peut-être qu'une jeune Planorbe. Il donne, en effet, après la description de son *Physa planorbula*, les détails suivants :

"This singular shell was found by Mr. G. B. GLENDINING at the Cohoes Falls adhering to stones. I have adopted the name proposed by its discoverer. It was alive, and was destitute of an opercle. It is supposed by some conchologists to be a young *Planorbis*, but I cannot learn that it has been found in the intermediate stages. It is placed provisionally here: but if a perfect animal, must constitute a new genus. I am inclined to suspect that it is the animal described by Say as *Bulla fluviatilis*." [*Bulla fluviatilis* SAY, Journal Academy Natural Sciences of Philadelphia, II, p. 178]. Cependant une de ces formes intermédiaires avait été décrite, par I. LEA, deux ans avant la publication du travail de DE KAY, sous le nom de *Planorbis regularis* [I. LEA, Transactions American Philosophical Society, IX, 1841, p. 6].

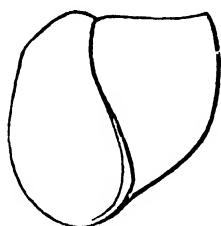
⁶ Les 2½ premiers tours sont visibles, à la face supérieure de la coquille, même lorsque cette dernière en est encore au stade physiforme.

Il est particulièrement intéressant de constater le parallélisme complet existant entre le développement du *Planorbis* (*Planorbis*) *exustus* Deshayes de l'Inde et le *Planorbis* (*Pierosoma*) *trivolvus* Say de l'Amérique du Nord. Dans les deux cas, la coquille très jeune ressemble à une Physe ;¹ puis elle prend, à mesure que l'animal grandit, d'abord la forme d'un Planorbe très globuleux² et, enfin, celle d'un Planorbe normal. Cette dernière transformation s'opère régulièrement et assez vite.

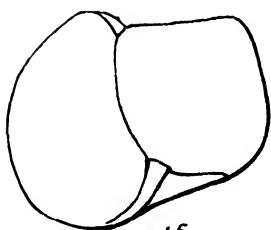
Dans tous les cas envisagés ci-dessus, les jeunes coquilles ont un test très mince, parfois subpellucide, fragile, transparent, d'un corné jaunâtre ou fauve clair.



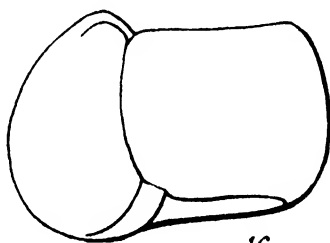
13.



14.



15.



16.

FIG. 13-14-15 et 16.—Figures semi-schématiques montrant quatre stades successifs du développement du *Planorbis* (*Planorbis*) *exustus* Deshayes ; $\times 8$.

Sous-genre *Planorbina* Haldeman, 1842.

- 1842. *Planorbina* HALDEMAN, *A Monograph Limniades and other Fresh Water Shells North America*, IV, p. 14 (pas de type cité).
- 1847. *Anisus* GRAY, *Proceedings Zoological Society of London*, p. 187 [non *Anisus* STUDER, 1820].
- 1883. *Menetus* FISCHER, *Manuel de Conchyliologie*, etc . . . , Paris, p. 500 [non *Menetus* ADAMS, 1855].
- 1899 (Avril) *Menetus* MARTENS, *Land and Freshwater Mollusks (Biologia Centrali-Americana, London)*, p. 390 [type : *Planorbis quadratus* Penns Sowerby].

¹ Fig. 13—14 (dans le texte), pour le *Planorbis* (*Planorbis*) *exustus* Deshayes ; *Physa planorbula* De Kay, pour le *Planorbis* (*Pierosoma*) *trivolvus* Say.

² Fig. 15—16 (dans le texte), pour le *Planorbis* (*Planorbis*) *exustus* Deshayes *Planorbis regularis* Lea pour le *Planorbis* (*Pierosoma*) *trivolvus* Say.

1905. *Planorbina* DALL, Land and Freshwater Mollusks of Alaska, (Harriman Alaska Expedition, XIII, New-York), p. 81 et p. 84.

Coquille grande ou assez grande, discoïde, très aplatie; spire composée de tours nombreux à enroulement lent et régulier, comprimés à leur partie inférieure; ouverture très oblique.

Type: *Planorbis guadalupensis* Sowerby.

Les *Planorbina* vivent dans les Antilles et dans l'Amérique du sud. Ils se séparent des *Planorbis* sensu stricto par leur forme plus comprimée et par leur spire à tours plus nombreux, s'accroissant plus lentement et comprimés à leur partie inférieure. Ils sont, d'ailleurs, très voisins de certains vrais Planorbes de l'Afrique équatoriale [*Planorbes* du groupe du *Planorbis* (*Planorbis*) *sudanicus* Martens].

Planorbis (*Planorbina*) *glabratus* Say.

1818. *Planorbis glabratus* SAY, *Journal Academy Natural Sciences Philadelphia*, I, p. 280.
 1834. *Planorbis lentus* SAY, *American Conchology*, VI, p. 6, pl. iv, fig. 1.
 1844. *Planorbis glabratus* HALDEMAN, *Monograph of the Limniades and other Fresh Water Univalve Shells*, p. 11 (part).
 1865. *Planorbis glabratus* BINNEY, *Land and Freshwater Shells North Amer.*, II, p. 106 (part).
 1878. *Planorbis lentus* NEVILL, *Handlist Mollusca Indian Museum, Calcutta*, I, p. 242, No. 14.
 1880. *Planorbis lentus* CLESSIN, *Die Familie der Limnæiden*, in: MARTINI et CHEMNITZ, *Systemat Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 80, No. 57 (part).
 1886. *Planorbis glabratus* CLESSIN, *loc. supra cit.*, XVII, p. 112, No. 78, taf. xviii, fig. 2.
 1905. *Planorbis* (*Planorbina*) *glabratus* DALL, *Land and Fresh Water Mollusks of Alaska*, p. 86.
 1918. *Planorbis glabratus* BRYANT WALKER, *Synopsis... Freshwater Mollusca North America, etc...*, *University of Michigan, Miscellaneous Publications* No. 6, Michigan, p. 99.

LOCALITÉS :

Etats-Unis de l'Amérique du Nord : Etat de l'Ohio, sans localité précise; 5 exemplaires; = Etat de Géorgie, sans localité précise [Prof. W. NEWCOMB]; 3 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Les Etats-Unis du Sud-est, notamment les Etats de Géorgie¹ de la Caroline du sud, de la Louisiane.¹ Ce Planorbe a également été signalé au Mexique, peut être par confusion avec certaines variétés du *Planorbis* (*Pierosoma*) *tenuis* Dunker.²

¹ Où ce Planorbe remplace partiellement le *Planorbis* (*Pierosoma*) *trivoltis* Say

² DUNKER (W.), *Limnæacæ*, in: MARTINI (F. H. W.) et CHEMNITZ V.V. *Systemat. Conchylien-Cabinet*, 2^e Edit, Nürnberg, 1856, p. 45, No. 11, taf. ix, fig. 14 à 19 et taf. xvi, fig. 22 à 25.

Coquille atteignant de 25 à 30 millimètres de diamètre maximum et 6 à 7 millimètres de hauteur. Elle est assez solide, finement striée, d'un corné jaunâtre ou marron médiocrement brillant.

Planorbis (Planorbina) guadalupensis Sowerby.

1830. *Planorbis guadalupensis* SOWERBY, *Genera of recent and fossil Shells*, II, p. 2 (sans pagination), et fig. 2 de la Planche non numérotée consacrée aux Planorbes.
1837. *Planorbis guadalupensis* BECK, *Index Molluscorum*, p. 120.
1837. *Planorbis striatulus* RICHARD, in: BECK, *Index Molluscorum*, p. 120.
1844. *Planorbis Guadalupeensis* POTIEZ et MICHAUD, *Galerie Mollusques, Catalogue Muséum Douai*, p. 212, pl. xxi, fig. 10 à 12.
1854. *Planorbis guadalupensis* SHUTTLEWORTH, *Diagnosen neuer Mollusken*, VII, *Mittheilungen der Naturforsch. Gesellsch. Bern*, p. 155.
1856. *Planorbis Guadalupeensis* DUNKER, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 50, No. 18, taf. viii, fig. 7 à 9.
1859. *Planorbis xerampelinus* DROUËT, *Mollusques terr. eau douce Guyane. Mémoires soc. académ. Aube, Troyes*, XXIII, p. 372, No. 2, tab. ii, fig. 27—29.
1873. *Planorbis guadalupensis* MARTENS, *Die Binnenmollusken Venezuela's, Festschrift. . . Gesellsch. Naturforsch. Freunde Berlin*, p. 195, taf. ii, fig. 7.
1878. *Planorbis (Menetus) guadalupensis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 242, No. 17.
1878. *Planorbis Guadalupeensis* SOWERBY, *Monograph of the genus Planorbis*, in: L. REEVE, *Conchologia Iconica*, XX, London, pl. , fig.
1883. *Planorbis guadalupensis* MAZÉ, *Journal de Conchyliologie*, XXI, p. 27, No. 45; p. 44, No. 16 et p. 50, No. 12.
1891. *Planorbis guadeloupensis* CROSSE, *Journal de Conchyliologie*, XXXIX, p. 158, No. 164.
1913. *Planorbis guadelupensis* VERNHOUT, *Notes from the Leyden Museum*, XXXVI, p. 21, No. 52.
1917. *Planorbis guadelupensis* ITURBE, *The intermediate host of Schistosomum mansoni in Venezuela*, Caracas, p. 7, pl. ii, fig. 1 à 3.¹
1918. *Planorbis guadelupensis* LUTZ, *Memorias do Instituto Oswaldo Cruz*, X, fasc. I, Rio de Janeiro, p. 72, No. 4, Est. xvii, fig. 1, 1a, 1b, 1c, 1d.; et (traduction anglaise), p. 52, No. 4.

LOCALITÉS :

Antilles: Porto-Rico, Rio Blanco; un exemplaire; No. M. 4108; = La Guadeloupe, sans indication précise de localité [Prof. W. NEWCOMB]; un exemplaire; = Ile d'Antigua (Petites Antilles anglaises) [G. NEVILL]; un exemplaire.

Guyane française: Cayenne [G. NEVILL]; un exemplaire
Venezuela: Caracas; 4 exemplaires; = Envoi A. MORELET; 3 exemplaires.

¹ D'après le DR. J. ITURBE et le DR. E. GONZALES [*The intermediate host of Schistosomum mansoni in Venezuela*, Caracas, 1917], le *Planorbis (Planorbina) guadalupensis* Sowerby est le principal agent propagateur de la Bilharziose au Venezuela. La proportion des Planorbes de cette espèce parasités atteint jusqu'à 30% aux environs de Caracas.

DISTRIBUTION GÉOGRAPHIQUE.

Ce *Planorbe* est fort répandu dans les eaux douces de certaines îles des Antilles (Guadeloupe [H. CUMING, H. MAZÉ, G. SOWERBY, etc...]) et ses dépendances: îles de Saintes [LAROCHE, H. MAZÉ] et de Marie-Galante [PÉLISSIER DE MONTÉMONT]; Porto-Rico [B. F. BLAUNER] et Haïti (aux environs de Dondon, dans le montagne [H. ROLLE]) et de l'Amérique méridionale: Guyanes [F. CAILLIAUD, H. DROUET, van HEURN, KATE]; Venezuela (A. ERNST, A. MORELET] et Colombie [DR. E. von MARTENS]. Plus au sud, il semble remplacé par une espèce très voisine, le *Planorbis olivaceus* Spix.

Le *Planorbis xerampelinus* Drouët est certainement synonyme de cette espèce: H. DROUËT lui donne 18 millimètres de diamètre maximum et 5 millimètres de hauteur, ce qui correspond à des exemplaires de petite taille du *Planorbis guadalupensis* Sowerby. Les caractères de ce *Planorbe* varient considérablement: nous en parlerons à propos du *Planorbis olivaceus* Spix.¹

Planorbis (Planorbina) olivaceus Spix.

1786. *Helix cornea*, variété, CHEMNITZ, *Neues System, Conchylien Cabinet*, 1^{re} Edit., IX, 2^e part., p. 96, taf. cxxvii, fig. 1119—1120.
 1827. *Planorbis olivaceus* DE SPIX et WAGNER, *Testacea fluviatilia... Brasiliam*, p. 26, No. 1, tab. xviii, fig. 2.
 1827. *Planorbis ferrugineus* DE SPIX et WAGNER, *loc. supra cit.*, p. 26, tab. xviii, fig. 1. [non: *Planorbis ferrugineus* D'ORBIGNY²].

¹ H. B. PRESTON a décrit sous le nom de *Planorbis costaricensis* [Descriptions of new Species of Land and Freshwater Shells from Central and South America; *Annals and Magazine Natural History*, sér. 7, XX, December 1907, p. 496, fig. 16] une espèce de Catalina, dans la province de Guanacaste (Costa-Rica), possédant 4—5 tours de spire arrondis et mesurant 26 millimètres de diamètre maximum pour 9.5 millimètres de hauteur (ouverture: 9 millimètres de hauteur sur 6 millimètres de diamètre) qui n'est fort probablement, qu'une variété locale du *Planorbis guadalupensis* Sowerby.

² Dans un travail récent [Caramujos de agua doce do genero *Planorbis*, observados no Brasil, *Memorias do Instituto Oswaldo Cruz*, Rio de Janeiro, X, fasc. 1, 1918, pp. 65—82, Est. xv à xviii, le Doct. A. LUTZ a montré (p. 70 et traduction anglaise, p. 50) que le *Planorbe* des environs de Rio de Janeiro décrit par A. D'ORBIGNY sous le nom de *Planorbis ferrugineus* [Synopsis terr. et fluvial. *Molluscorum... Americam meridionalen*, Magasin de Zoologie de GUÉRIN-MÉNEVILLE, Paris 1835, p. 26, No. 1; et: *Voyage Amérique méridionale*, V, 3^e partie *Mollusques*, Paris, 1843, p. 344 (= *Planorbis ferrugineus* SOWERBY. Monograph of the genus *Planorbis*, in: L. REEVE, *Conchologia Iconica*, XX, London, 1878, pl. ix, fig. 73a—73b.] n'est pas la *Planorbis ferrugineus* DE SPIX et WAGNER (c'est-à-dire la *Planorbis olivaceus* DE SPIX) mais une espèce différente que A. LUTZ désigne sous le nom de *Planorbis confusus* Lutz [*loc. supra cit.*, 1918, p. 70, No. 2 (et traduction anglaise, p. 50, No. 2), est. xv, fig. 2, 2a, 2b, 2c et 2d], nom assez mal choisi, puisqu'il existe déjà un *Planorbis confusus* De Rochebrune, d'ailleurs synonyme du *Planorbis (Gyraulus) saigonensis* Crosse et Fischer. Quoiqu'il en soit, le *Planorbis (Planorbina) confusus* Lutz (= *Planorbis ferrugineus* D'ORBIGNY (non SPIX et WAGNER), = *Planorbis ferrugineus* Sowerby) est extrêmement voisin du *Planorbis (Planorbina) olivaceus* DE SPIX et WAGNER [= *Planorbis ferrugineus* DE SPIX et WAGNER, non A. D'ORBIGNY] dont il ne diffère que par sa coquille de taille plus petite (25 millimètres de diamètre maximum) ayant un tour de spire de moins et son animal de coloration plus foncée. Mais le *Planorbis (Planorbina) olivaceus* De Spix est souvent parasité par le *Schistosomum Mansoni* (auteur de la Bilharziose) tandis que le *Planorbis (Planorbina) confusus* Lutz scrait, d'après A. LUTZ [*loc. supra cit.*, 1918, p. 71 et traduction anglaise, p. 51] incapable de transmettre le parasite.

1837. *Planorbis olivaceus* BECK, *Index Molluscorum*, p. 120.
 1837. *Planorbis Lundii* BECK, *Index Molluscorum*, p. 120.
 1848. *Planorbis Cumingianus* DUNKER,¹ *Proceedings Zoological Society of London*, p. 41.
 1856. *Planorbis Cumingianus* DUNKER, in: MARTINI ET CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 49, No. 17, taf. viii, fig. 1 à 3.
 1856. *Planorbis olivaceus* DUNKER, in: MARTINI ET CHEMNITZ, *loc. supra cit.*, XVII, p. 48, No. 15, taf. viii, fig. 22 à 24.
 1878. *Planorbis olivaceus* LUTZ, *Memorias do Instituto Oswaldo Cruz*, Rio de Janeiro, X, fasc. I, p. 69, No. 1, Est. xv, fig. 1, 1a, 1b, 1c, 1d et. 1e; et (traduction anglaise). p. 49, No. 1.

LOCALITÉ :

Brésil : Environs de Bahia [DR. NAEGELI]; un exemplaire ;
 No. M. 4. III.

DISTRIBUTION GÉOGRAPHIQUE

Cette espèce est particulière au Brésil.

En décrivant ce Planorbe, le DR. J. A. WAGNER [*loc. supra cit.*, Monachii, 1827, p. 26] écrit :

< < Pl. testa discoidea, tenui, superne plano-depressa, inferne late umbilicata. olivacea, aufractu ultimo compresso.

< < a) Testa majore: *Planorbis olivaceus* Spix Tab. XVIII, fig. 2.

< < b) Testa minore: *Planorbis ferrugineus* Spix Tab. XVIII, Fig. 1. > >

La figure 2, ci-dessus citée, représente la face supérieure d'un Planorbe de grande taille (31 millimètres de diamètre maximum et 27½ millimètres de diamètre minimum) qui correspond, très sensiblement, comme dimensions, au *Planorbis Cumingi* Dunker². En fait les deux espèces sont absolument synonymes.

D'ailleurs le *Planorbis olivaceus* DE SPIX n'est bien certainement qu'une forme locale du *Planorbis guadalupensis* Sowerby auquel il est relié par tous les intermédiaires. Le *Planorbis Becki* Dunker³ est une de ces formes d'une taille égale à celle des exemplaires moyens du *Planorbis guadalupensis* Sowerby. Ce dernier Planorbe, comme le *Planorbis olivaceus* De Spix, atteint d'ailleurs jusqu'à 30 millimètres de diamètre maximum⁴.

¹ Non *Planorbis Cumingi* Beck (*Index Molluscorum*, 1837, p. 120) qui est le *Planorbis chilensis* ANTON (*Verzeichniss der Conchylien-Sammlung*, etc., Halle, 1839, p. 51).

² Le type figuré par le DR. W. DUNKER (*loc. supra cit.*, 1856, taf. viii, fig. 1 à 3) mesure 31 millimètres de diamètre maximum; 26 millimètres de diamètre minimum et 7 millimètres de hauteur.

³ DUNKER (DR. W.), in: MARTINI ET CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1856, p. 48, No. 16, taf. viii, fig. 4-5-6 [= *Planorbis Beckianus* SOWERBY, *Monograph of the genus Planorbis*, in: L. REEVE, *Conchologia Iconica*, XX, London, 1878, pl. vii, fig. 55a-55b].

⁴ Le DR. E. von MARTENS [*Die Binnenmollusken Venezuela's, Festschrift. . . Gesellsch. Naturf. Freunde Berlin*, 1873, p. 176] donne 28 millimètres de diamètre maximum pour les plus grands exemplaires de *Planorbis guadalupensis* Sowerby appartenant au Musée de Berlin.

Le *Planorbis lugubris* Wagner,¹ qui vit également au Brésil, semble mieux individualisé. Il est de taille plus faible,² ses tours de spire sont plus serrés, beaucoup plus fortement carénés en dessus et en dessous et sa face inférieure est plus profondément ombiliquée. Ainsi que l'a fait remarquer le Dr. E. von MARTENS, ce Planorbe,—auguel il rapporte en synonyme le *Planorbis bahiensis* Dunker,³ se rapproche du *Planorbis tenagophilus* d'Orbigny,⁴ établissant ainsi la liaison entre cette dernière espèce et celles du groupe du *Planorbis guadalupensis* d'Orbigny.

En comparant les caractères de ces divers Planorbes, on obtient le tableau suivant :

PLANORBIS GUADALUPENSIS.	PLANORBIS OLIVACEUS.	PLANORBIS LUGUBRIS.
Coquille très aplatie.	Coquille très aplatie.	Coquille aplatie.
Spire composée de 6 tours serrés à croissance lente et régulière en dessus et en dessous.	Spire composée de 6 tours serrés à croissance lente et régulière.	Spire composée de 6-6½ tours à croissance très serrée, lente et régulière.
Tours de spire à section elliptique	Tours de spire à section subelliptique.	Tours de spire à section subrectangulaire
Tours de spire convexes en dessus, à peine subconvexes en dessous.	Tours de spire convexes en dessus, presque plans en dessous.	Tours de spire presque plans en dessus et en dessous.
Dernier tour médiocre, à peine subcaréné.	Dernier tour médiocre, à peine subcaréné.	Dernier tour médiocre, avec une carène supérieure marginée et une carène inférieure très marquée.
Coquille presque plane ou subconcave en dessous.	Coquille presque plane ou subconcave en dessous.	Coquille largement et profondément concave en dessous, tous les tours montrant une carène inférieure très marquée.
Ouverture oblique, irrégulièrement semi-lunaire.	Ouverture oblique, irrégulièrement semi-lunaire.	Ouverture oblique, irrégulièrement subquadrangulaire, avec trois angles sites très marquées.
Dimensions des grands individus: [mill.]	Dimensions des grands individus: [mill.]	Dimensions des grands individus: [mill.]
Diamètre maximum: 28—30	Diamètre maximum: 27—30	Diamètre maximum: 22—25
Diamètre minimum: 25—27	Diamètre minimum: 24—26	Diamètre minimum: 20—22½
Hauteur: 7—8	Hauteur: 7—8	Hauteur: 8—8½
Hauteur de l'ouverture: 9—9½	Hauteur de l'ouverture: 9—9½	Hauteur de l'ouverture: 8½—9
Diamètre de l'ouverture: 7½—8	Diamètre de l'ouverture: 9—9	Diamètre de l'ouverture: 8½—9½

¹ WAGNER (DR. J. A.), *Testacea fluviatilia ... Brasiliam*, Monachii, 1827, p. 27, No. 2, tab. xviii, fig. 3—6. [= *Planorbis nigricans* DE SPIX, *Planorbis albens* DE SPIX, *Planorbis viridis* DE SPIX, loc. supra cit., 1827, p. 27 (formes jeunes). = *Planorbis lugubris* MARTENS, *Malakozoolog. Blätter*, XV, 1868, p. 186; et: loc. supra cit., 1873, p. 196, taf. ii, fig. 8; = *Planorbis lugubris* SOWERBY, in: REEVE, loc. supra cit., 1878, pl. iii, fig. 24a—24b; = *Planorbis lugubris* CLESSIN, in: MARTINI et CHEMNITZ, loc. supra cit., 1886, p. 114, No. 81 (indiqué, par erreur, No. 12), taf. xii, fig. 17 à 19; = *Planorbis (Menethes) nigricans* LUTZ, loc. supra cit., 1918, p. 71, No. 3 et traduction anglaise, p. 51, No. 3), est. xv, fig. 3a, 3b, 3c, et 3d].

² Il mesure: 24 millimètres de diamètre maximum; 21 millimètres de diamètre minimum et 7½ millimètres de hauteur.

³ DUNKER (DR. W.), in: MARTINI et CHEMNITZ, loc. supra cit., 1856, p. 51, No. 19, taf. viii, fig. 13 à 18.

⁴ MARTENS (DR. E. von), *Ueber südbrasilische Land-und Süßwasser-Mollusken*.

De ces caractères il résulte que les *Planorbis guadalupensis* Sowerby et *Planorbis olivaceus* Spix doivent être considérés comme synonymes, le second étant seulement une forme locale du premier ; et que le *Planorbis lugubris* Wagner est une espèce assez distincte, se rapprochant du *Planorbis tenagophilus* d'Orbigny. Ces divers Planorbes se groupent ains.

1. [^a] PLANORBIS GUADELUPENSIS Sowerby.

= *Planorbis striatulus* Richard.

= *Planorbis Becki* Dunker.

= *Planorbis xerampelinus* Drouët.

= ? *Planorbis costaricensis* Preston.

[^β] PLANORBIS OLIVACEUS De Spix (forma major).

= *Planorbis ferrugineus* De Spix [non A. D'ORBIGNY].

= *Planorbis Cumingi* Dunker.

= *Planorbis Lundii* Beck.

[^γ] PLANORBIS CONFUSUS LUTZ [non DE ROCHEVERRUNE].

= *Planorbis ferrugineus* d'Orbigny [non DE SPIX et WAGNER].

= *Planorbis ferrugineus* Sowerby.

2. PLANORBIS LUGUBRIS Wagner.

= *Planorbis nigricans* De Spix et Wagner.

= ? *Planorbis bahiensis* Dunker.

= *Planorbis nigricans* Lutz.

Planorbis (Planorbina) Blauneri (Shuttleworth) Germain, nov. sp. Pl. IV, fig. 2 et 7, et Fig. 17, dans le texte.

1918. *Planorbis Blauneri* SHUTTLEWORTH mss., in : *Collect. Indian Museum, Calcutta.*

LOCALITÉ :

Antilles ; Ile Viaque, près de l'île de Porto-Rico ; type [Collect. G. Nevill], No. 131 et No. M. 4105.

Coquille bien déprimée, largement excavée en dessus, presque plane en dessous ; spire composée de 6 tours convexes,¹ serrés, à

Malakozoolog. Blätter, XV, 1868, p. 126, No. 27, et pp. : 127—128. Le Dr. E. von MARTENS ajoute que le *Planorbis ferrugineus* d'Orbigny est probablement la même espèce : < < Orbigny's sogenannter *Pl. ferrugineus* von den Sümpfen von S. Christoph bei Rio Janiero ist vermuthlich auch derselbe > >. Je ne suis pas de cet avis : le *Planorbis ferrugineus* d'Orbigny n'étant qu'une forme de petite taille du *Planorbis olivaceus* Wagner à laquelle A. LUTZ a donné le nom de *Planorbis confusus* Lutz. Dans le travail que j'ai précédemment cité, A. LUTZ considère (p. 71 et traduction anglaise, p. 51) le *Planorbis tenagophilus* d'Orbigny comme synonyme du *Planorbis lugubris* Wagner. Je ne crois pas que cette identification soit exacte et malgré les rapports évidents qui unissent les deux Planorbes, je considère le *Planorbis tenagophilus* d'Orbigny comme une espèce distincte appartenant au sous-genre *Pterosoma*.

¹ En dessous les derniers tours sont très vaguement subanguleux contre la suture.

croissance très lente et bien régulière, séparés par des sutures marquées; dernier tour médiocre, arrondi, comprimé à la base, avec, en dessous, une vague angulosité carénale presque contre la suture; ouverture irrégulièrement ovalo-triangulaire transverse,¹ très oblique, subanguleuse à la base, avec un bord supérieur con-

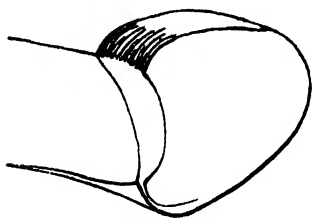


FIG. 17.—*Planorbis* (*Planorbina*) *Blauneri* (Shuttleworth) Germain.

Ile Viaque, près de l'île de Porto-Rico. Schema de l'ouverture; $\times 6$ environ.

convexe dans une direction légèrement ascendante et un bord externe à peine subconvexe dans une direction très obliquement descendante se rattachant, sans angulosité au bord supérieur; bords marginaux éloignés, convergents, le supérieur dépassant très notablement le columellaire, réunis par une callosité blanche bien marquée mais peu épaisse

Diamètre maximum: $13\frac{1}{2}$ — $14\frac{1}{2}$ millimètres; ¹ diamètre mini-

mum: 11 — $11\frac{1}{2}$ millimètres; ² hauteur: 4 — $4\frac{1}{2}$ millimètres; ² diamètre de l'ouverture: $5\frac{1}{4}$ — $5\frac{1}{2}$ millimètres; ² hauteur de l'ouverture: $4\frac{3}{4}$ — 5 millimètres.²

Test assez mince, un peu léger, subtransparent, d'un blond corné légèrement brillant, recouvert d'un épiderme noirâtre; stries longitudinales très fines, peu obliques, serrées et irrégulières, sensiblement aussi développées en dessous qu'en dessus.

Ce Planorbe, que j'ai trouvé étiqueté dans le Collection du Musée de Calcutta "*Planorbis Blauneri* Shuttleworth, nov. sp." n'est bien certainement qu'une variété du *Planorbis* (*Planorbina*) *guadalupensis* Sowerby. C'est, dans les deux cas, la même forme générale avec une spire à enroulement très lent et à tours très serrés le dernier étant comprimé de bas en haut. Mais, chez le *Planorbis* (*Planorbina*) *Blauneri* (Shuttleworth) Germain, la taille est beaucoup plus petite, le dernier tour est, en dessus,³ proportionnellement moins développé et les premiers tours sont bien plus profondément enfoncés, la face supérieure de la coquille étant, en définitive, largement et assez profondément ombiliquée.⁴

En résumé le *Planorbis* (*Planorbina*) *Blauneri* (Shuttleworth) Germain se rattache, comme variété, au *Planorbis* (*Planorbina*) *guadalupensis* Sowerby. Le Planorbe du Musée de Calcutta provient d'une des localités les plus septentrionales où il a été signalé des représentants du sous-genre *Planorbina*.

¹ Ou, plus exactement, subtriangulaire (Fig. 17, dans le texte).

² Ces dimensions correspondent au type de l'espèce, conservé dans les Collection de l'Indian Museum (*Natural History*), à Calcutta.

³ En dessous, l'enroulement est identique à celui du *Planorbis* (*Planorbina*) *guadalupensis* Sowerby typique.

⁴ En définitive le *Planorbis* (*Planorbina*) *Blauneri* (Shuttleworth) Germain est une variété minor et largement ombiliquée en dessous (mode *macroporus*) du *Planorbis* (*Planorbina*) *guadalupensis* Sowerby.

Sous-Genre *Pierosoma* Dall, 1905.

1905. *Pierosoma* DALL, Land and Freshwater Mollusks of Alaska, *Harriman Alaska Expedition*, XIII, New-York, p. 81 et p. 85 (type : *Planorbis trivolvis* Say) [= *Helisoma* (part) auct., non SWAINSON, p. *Planorbis trivolvis* Say].

Coquille de grande taille, relativement haute, plus profondément ombiliquée en dessus qu'en dessous ; spire composée de tours peu nombreux garnis de stries longitudinales fortes, les premiers tours carénés et aplatis en dessous ; ouverture grande, réfléchie, à bords plus ou moins épaissis.

Type : *Planorbis trivolvis* Say.

Les *Pierosoma* sont répandus abondamment dans toute l'Amérique du Nord, dans l'Amérique Centrale et dans les Antilles. Ils atteignent leur maximum de développement dans l'Amérique du Nord où ils donnent naissance à de nombreuses espèces, variétés ou formes locales. Les *Pierosoma* correspondent, dans le Nouveau Monde, au *Planorbis* (*Planorbis*) *corneus* Linné et ses variétés de l'Europe et au *Planorbis* (*Planorbis*) *exustus* Deshayes et ses variétés de l'Asie méridionale et orientale (Inde et Indochine).

§. I.

Planorbis (*Pierosoma*) *ammon* Gould.

1855. *Planorbis ammon* GOULD, *Proceedings Society Natural History Boston*, V, p. 129.
 1857. *Planorbis ammon* GOULD, *Pacif. Report*, V, p. 332, pl. xi, fig. 12 à 18.
 1865. *Planorbis ammon* BINNEY, *Land and Freshwater Shells North America*, II, p. 112, fig. 187.
 1878. *Planorbis ammon* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. xii, fig. 108.
 1878. *Planorbis ammon* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 241, No. 8.
 1886. *Planorbis Ammon* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 180, No. 170, taf. xxv, fig. 3 et taf. xxvi, fig. 3.

LOCALITÉS :

Etats Unis : Orégon, sans localité précise [Prof. W. NEWCOMB] ;
 =Californie, sans localité précise [Prof. E. C. STEARNS].

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce vit, aux États-Unis, dans les États de Californie et de l'Orégon.

Le *Planorbis* (*Pierosoma*) *ammon* Gould est une espèce de forme relativement variable, voisine du *Planorbis* (*Pierosoma*) *corpulentus* Say, dont elle diffère par son test notablement plus fragile, orné de stries plus fines ; par son enroulement plus rapide avec un dernier tour plus dilaté vers l'extrémité ; par son ouverture beaucoup plus développée en hauteur ; etc. . . Il est encore

plus voisin du *Planorbis* (*Pierosoma*) *Binneyi* Tryon,¹ espèce au test plus solide, à la sculpture plus accentuée et plus irrégulière, habitant l'Orégon et la Colombie, mais sans dépasser, vers l'est, la chaîne des Montagnes Rocheuses. C'est plus particulièrement une forme des régions du nord remplaçant, dans beaucoup de localités, le *Planorbis* (*Pierosoma*) *trivolvris* Say.²

Le *Planorbis* (*Pierosoma*) *magnificus* Pilsbry,³ trouvé dans un lac près de Wilmington, dans le nord de l'état de Caroline (Etats-Unis) appartient encore au même groupe. Il en est de même du *Planorbis* (*Pierosoma*) *Traskii* Lea,⁴ espèce très remarquable de la Californie, que beaucoup d'auteurs ont confondu soit avec le *Planorbis* (*Pierosoma*) *ammon* Gould, soit avec le *Planorbis* (*Planorbis*) *corpulentus* Say.

Planorbis (*Pierosoma*) *trivolvris* Say.

- 1817. *Planorbis trivolvris* SAY, *Nicholson's Encyclop.*, 1^{re} Edit. (non paginée), pl. ii, fig. 2.
- 1821. *Planorbis trivolvris* SAY, *Journal Academy Natural Sciences of Philadelphia*, II, p. 164.
- 1826. *Helix planorbis* EATON, *Zoology, Text-Book*, p. 194 (non LINNÉ).
- 1834. *Planorbis trivolvris* SAY, *American Conchology*, VI, pl. liv, fig. 2.
- 1838. *Planorbis proboscideus* POTIEZ et MICHAUD, *Galerie Mollusques Douai*, I, p. 213, pl. xxv, fig. 13—15.
- 1838. *Planorbis trivolvris* POTIEZ et MICHAUD, *loc. supra cit.*, p. 214, pl. xxv, fig. 19—21.
- 1841. *Planorbis regularis* SAY, *Transactions American philosoph. Society*, IX, p. 6.
- 1843. *Planorbis megastoma* DE KAY, *Zoology of New-York*, part V, *Mollusca*, p. 61, pl. iv, fig. 60—61.
- 1843. *Planorbis corpulentus* DE KAY, *loc. supra cit.*, p. 64, pl. xiii, fig. 185 [non SAY].
- 1843. *Planorbis planorbula* DE KAY, *loc. supra cit.*, p. 76, pl. v, fig. 83 [forma juven.].
- 1844. *Planorbis trivolvris* HALDEMAN, *Monograph of the Limniades and other Fresh Water Univalve Shells*, p. 13, pl. ii, fig. 4 à 7.
- 1850. *Planorbis trivolvris* KÜSTER et DUNKER, *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *Systemat. Conchylien Cabinet*, XVII, p. 53, No. 23, taf. v, fig. 4 à 6; taf. vi, fig. 1 à 6; taf. ix, fig. 4 à 6, 20, 21, 22, 23, 24 et 25.
- 1865. *Planorbis trivolvris* BINNEY, *Land and Freshwater Shells of North Amer.*, II, p. 115, fig. 194 à 201.
- 1865. *Planorbis oregonensis* TRYON, *American Journal of Conchology*, I, p. 231, pl. xxii, fig. 17.

¹ TRYON (W.), *American Journal of Conchology*, III, 1867, p. 197; = DALL (W. H.), *Land and Freshwater Mollusks of Alaska*, 1905, p. 87, fig. 66 et 67 [= *Planorbis corpulentus* HALDEMAN, *Monogr. Freshwater Univalve Shells* . . . , 1844, p. 19, pl. iii, fig. 7 à 9; = BINNEY, *Land and Freshwater Shells North America* II, 1865, p. 103, fig. 175 [non SAY].

² Cf. : BAKER (FRANK COLLINS), *Note on Planorbis Binneyi Tryon*, *The Nautilus*, XXIII, Juillet 1909, No. 3, pp. 41—42.

³ PILSBRY (H. A.), *The Nautilus*, XVII, Nov. 1903, p. 75. Figuré par P. BARTSCH, *Notes on the Fresh-Water Mollusk Planorbis magnificus and description two new forms of the same genus* . . . , *Proceedings United States National Museum*, XXXII, 4 Mars 1908, p. 697, pl. lvii, fig. 7 à 9.

⁴ LEA (I.), *Proceedings Academy Natural Sciences of Philadelphia*, VIII, 1856, p. 80; et: *Observations on the genus Unio*, Vol. XI, Philadelphia, 1867, p. 113, pl. xxiii, fig. 70.

1872. *Planorbis oregonensis* TRYON, *Monograph Fresh-Water Univalve Mollusca United States*, Philadelphia, p. 201, pl. vi, fig. 10—12 (= jeune).¹
1878. *Planorbis trivolvis* SOWERBY, *Monograph of the genus Planorbis*, in: L. REEVE, *Conchologia Iconica*, XX, London, pl. i, fig. 2.
1878. *Planorbis trivolvis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 241, No. 4.
1878. *Planorbis corpulentus* NEVILL, *loc. supra cit.*, I, p. 241, No. 7 [non SAY.]
1878. *Planorbis horni* NEVILL, *loc. supra cit.*, I, p. 242, No. 15.
1886. *Planorbis occidentalis* COOPER, in: Collect. DUNKER, in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, p. 407, taf. xvii, fig. 13.
1886. *Planorbis Oregonensis* CLESSIN, in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, p. 181, No. 171, taf. xxv, fig. 4.
1886. *Planorbis Hornii* CLESSIN, in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, p. 182, No. 172, taf. xxvii, fig. 9.
1905. *Planorbis (Pierosoma) trivolvis* DALL, *Land and Freshwater Mollusks of Alaska*, p. 88, fig. 68.

LOCALITÉS:

Canada: Prince Edward's Isl. [Coll. G. NEVILL].

Etats Unis: Schuylkill River, Michigan, sans localité précise [E. R. BEADLE]; = New Jersey, sans localité précise [E. R. BEADLE]; = New England, sans localité précise [Prof. E. C. STEARNS]; = Californie, sans localité précise [Prof. E. C. STEARNS]; = Ohio, sans localité précise; 3 exemplaires recueillis avec des specimens du *Planorbis (Planorbella) campanulatus* Say; = Sierra Nevada, sans localité précise; deux exemplaires de la variété *subcrenatus* Carpenter [Prof. E. C. STEARNS].

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce habite presque toute l'Amérique du Nord, depuis les confins du Mexique jusqu'à l'Alaska, mais à peu près uniquement à l'est des Montagnes Rocheuses.

Le *Planorbis (Pierosoma) trivolvis* Say est une espèce très abondante dans les eaux douces de l'Amérique du Nord; elle varie dans des proportions considérables rappelant, de ce point de vue, le *Planorbis (Planorbis) corneus* Linné de l'Europe et le *Planorbis (Planorbis) exustus* Deshayes de l'Inde.

Il est à peu près impossible de délimiter des variétés stables sauf, peut être, la variété *subcrenatus* Carpenter¹ rééditée² par G. W. TRYON³ sous le nom de *Planorbis Hornii*.⁴ Ces deux coquilles sont, en effet, synonymes et W. H. DALL ajoute: "Je n'ai,

¹ CARPENTER, *Proceedings Zoological Society of London*, 1856, p. 220. Cette coquille a été figurée par W. G. BINNEY [*Land and Freshwater Shells North America*, II, 1865, p. 103, fig. 176] et par G. W. TRYON, *Monograph of the Fresh-Water Univalve Mollusca of the United States*, Philadelphia, 1872, p. 189, pl. v, fig. 1, 2].

² Cette coquille vit dans la Californie, l'Orégon et la Colombie britannique, mais seulement à l'Ouest des Montagnes Rocheuses.

³ TRYON (G. W.), *American Journal of Conchology*, I, 1865, p. 231, pl. xxii, fig. 16; et *loc. supra cit.*, Philadelphia, 1872, p. 190, pl. v, fig. 3, 4.

⁴ Vit dans les mêmes régions que la variété *subcrenatus* Carpenter.

jamais vu aucun specimen correspondant exactement à la figure donnée par TRYON de son *Pl. Hornii*, mais les variations du *Planorbis subcrenatus* que j'ai observées en sont souvent si étroitement voisines que j'ai peu de doutes quant à leur identité¹."

Parmi les nombreuses formes de coquilles du *Planorbis trivolvis* Say, il en est qui ont été considérées soit comme des variétés soit même comme des espèces distinctes. Tel est le cas de la variété *disjectus* Cooper² du lac Tahoe, en Californie, qui n'est qu'une malformation. Quant au *Planorbis macrostomus* Whiteaves³ [= *Planorbis lentus* GOULD,⁴ non SAY],⁵ il a été établi sur une déformation assez singulière portant sur le dernier tour et sur l'ouverture de la coquille. Cette dernière, vaguement subquadrangulaire, à peu près aussi haute que large, à bords rapprochés et convergents réunis par une forte callosité, richement colorée intérieurement, est bordée par un péristome épaissi et un peu réfléchi.⁶

Parmi les assez nombreux specimens de cette espèce appartenant aux collections du Musée d'Histoire naturelle de Calcutta, il en est qui sont étiquetés *Planorbis Hornii* Tryon et *Planorbis corpulentus* Say.

Ceux nommés *Planorbis Hornii* Tryon, et qui proviennent de la Sierra Nevada où ils ont été recueillis par le Prof. E. C. STEARNS, appartiennent bien à la variété *subcrenatus* Carpenter. J'en figure un exemplaire (Pl. I, fig. 1—2—3) intéressant par son test mince, léger, subtransparent, d'un corné jaunâtre assez clair, ses stries longitudinales fortement marquées, même un peu saillantes, très obliquement onduleuses, serrées, irrégulières et son ouverture subarrondie, un peu élargie en haut, à bords réunis par une faible callosité entourée d'un péristome légèrement bordé et subréfléchi.

Quant aux specimens étiquetés *Planorbis corpulentus* Say,⁷ ils ne se rapportent nullement à cette très rare espèce⁸ presque

¹ "I have never seen any specimens corresponding exactly to Tryon's figure of *P. hornii*, but the variations I have seen of *P. subcrenatus* often approach it so closely that I have little doubt of their identity" [W. H. DALL, Land and Freshwater Mollusks of Alaska, *Harriman Alaska Expedition*, Vol. XIII, New-York, 1905, p. 90.

² COOPER (J. G.), Notes on Raymond's Subalpine Mollusca. *Proceedings California Academy of Sciences*, 2^e série, III, 1890, p. 84, pl. i, fig. 30 (*Planorbis subcrenatus disjectus*).

³ WHITEAVES (J. F.), On the Land and Freshwater Mollusca of Lower Canada, *Canadian Naturalist*, VIII, Février et Avril 1863, p. 113.

⁴ GOULD (A. A.), Report on the Invertebrata of Massachusetts, *Comprising the Mollusca, Annelida and Radiata*, Cambridge, 1841, p. 202, fig. 132.

⁵ Cette forme de coquille a été recueillie au Canada [J. F. WHITEAVES] et, d'ailleurs, retrouvée plus récemment dans le lac des Bois (Manitoba) par DAWSON [cf. : A. W. HANHAM, A List of Land and Fresh-Water Shells of Manitoba, *The Nautilus*, Philadelphia, XIII, No. 1, Mai, 1899, p. 6].

⁶ W. H. DALL, [loc. *supra cit.*, 1905, p. 89, fig. 69] a exactement figuré cette curieuse monstruosité.

⁷ Ils proviennent de l'Orégon, sans localité précise [Prof. W. NEWCOMB] et de l'Etat de New-York, également sans localité précise [Prof. E. C. STEARNS].

⁸ Ce sont des *Planorbis trivolvis* Say à peu près typiques. Cependant l'un d'eux, de taille assez grande (25 millimètres de diamètre maximum et 13 millimètres de hauteur maximum) présente quelques intéressants caractères. Son ouverture, très développée en hauteur (14 millimètres de hauteur et 13 millimètres de diamètre), subtriangulaire, anguleuse en bas, élargie en haut, montre un péristome

toujours confondue avec les nombreuses variétés du *Planorbis* (*Pierosoma*) *trivolvus* Say. Le véritable *Planorbis* (*Pierosoma*) *corpulentus* Say,¹ qui a été très complètement étudié et fort exactement figuré par BRYANT WALKER,² est une coquille remarquable par sa hauteur relativement considérable par rapport à son diamètre maximum; par son enroulement très particulier (elle est presque plane en dessus avec, en dessous, un ombilic large et cratériforme laissant voir entièrement les premiers tours de spire); par ses tours de spire bicarénés, le dernier très grand avec, en haut et en bas, une carène très saillante³; par son ouverture ample, plus haute que large et, enfin, par sa sculpture. Cette dernière se compose de très fortes stries costulées, subverticales, à peine ondulenses, irrégulières et serrées.

Le *Planorbis* (*Pierosoma*) *corpulentus* Say est une excellente espèce très distincte, non seulement du *Planorbis* (*Pierosoma*) *trivolvus* Say, mais encore des *Planorbis* (*Pierosoma*) *Binneyi* Tryon et *Planorbis* (*Pierosoma*) *ammon* Gould des contrées occidentales et méridionales de l'Amérique du Nord.⁴ C'est un Planorbe des régions septentrionales, connu seulement d'un petit nombre de localités des Etats-Unis (Nord de l'Etat de Michigan, Etat de Minnesota [Vermillion Lake]) et du Canada (Ontario et Manitoba, notamment dans les lacs des Bois et Winipeg, la rivière Winipeg).

§. II.

Planorbis (*Pierosoma*) *tumidus* Pfeiffer.

- 1839. *Planorbis tumidus* PFEIFFER, in: *Wiegman's Archiv für Naturg.*, p. 354 (sine descrip.).
- 1856. *Planorbis tumidus* DUNKER, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit. XVII, Nürnberg, p. 39, No. 4, taf. vii, fig. 10-12 et taf. ix, fig. 1 à 3 (var. minor).
- 1861. *Planorbis tumidus* TRISTRAM, *Proceedings Zoological Society of London*, p. 232.
- 1865. *Planorbis tumidus* BINNEY, *Land and Freshwater Shells of North America*, II, p. 105, fig. 178.
- 1865. *Planorbis tumidus* MARTENS, *Malakozoolog. Blätter*, XII, p. 54.
- 1873. *Planorbis tumidus* STREBEL, *Beitrag zur kenntniss der Fauna Mexic.*, p. 40, taf. v, fig. 20 et 20 b.

très épais et continu, les bords marginaux étant réunis par une forte et épaisse callosité blanche. Le test est lui-même solide, garni de stries costulées, inégalement espacées, irrégulières et très obliquement ondulenses.

¹ SAY (TH.), *Long's Expedition St. Peter-River*, II, 1824, p. 262, pl. xv, fig. 9 (non BINNEY, GOULD, HALDEMAN) [= *Planorbis corpulentus* (part) SOWERBY, *Monograph of the genus Planorbis*, in: L. REEVE, *Conchologia Iconica*, XX, London, 1878, pl. i, fig. 4; = *Planorbis corpulentus* CLESSIN, *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 144, No. 122 (excl. synonym. et figur.); = *Planorbis corpulentus* BRYANT WALKER, *The Nautilus*, XIII, No. 12, Avril 1900, pp. 133-138, pl. iii, fig. 1 à 7 et Vol. XIV, No. 3, Juillet 1900, pp. 33-34; = *Planorbis* (*Pierosoma*) *corpulentus* DALL, *Land and Freshwater Mollusks of Alaska*, New-York, 1905, p. 87, fig. 65].

² WALKER (BRYANT), *The genuine Planorbis corpulentus* Say, *The Nautilus*, XIII, No. 12, Avril 1900, pp. 133-138, pl. iii.

³ En regardant la coquille du côté de l'ouverture, les carènes font, avec le profil du tour, un angle à peu près droit.

⁴ *V. ante*, p. 50.

1878. *Planorbis tumidus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 242, No. 13.
 1884. *Planorbis tumidus* FISCHER et CROSSE, *Etudes Mollusques terr. et fluvial. Mexique et Guatemala*, Paris, II, p. 66, No. 5, pl. xxxiv, fig. 4-4b.
 1891. *Planorbis tumidus* PILSBRY, *Proceedings Academy Natural Sciences of Philadelphia*, p. 322.
 1895. *Planorbis mysarus* MABILLE, *Bulletin société philomatique Paris*, 8^e série, VII, No. 2, p. 63.¹
 1899. *Planorbis (Helisoma) caribaeus* MARTENS, *Land and Freshwater Mollusca* (Biologia Centrali-Americana, London), p. 387, No. 4, pl. xxi, fig. 8, 9 et 9 a (part).

LOCALITÉS :

Etats-Unis d'Amérique : Le Texas, sans indication précise de localité [Prof. W. NEWCOMB]; 5 exemplaires.

Nicaragua . sans localité précise ; 3 exemplaires.

Antilles : Porto Rico : Humacas ; No. M. 4106 ; = Ile Viaque, près de Porto-Rico [Envoi SHUTTLEWORTH] ; un exemplaire ; No. M. 4114.

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis (Pierosoma) tumidus* Pfeiffer habite le sud des Etats-Unis, dans le Texas [Lieut. COUCH et G. WURDEMAN, in : W. G. BINNEY] et la Californie [L. DIGUET] ; = le Mexique [DE CANDÉ, H. CROSSE et P. FISCHER, HEGEWISCH, A. HEILPRIN, H. HÖGE, F. LIEBMANN, A. SALLÉ, T. SAY, H. STREBEL, C. A. UHDE, etc. . .] ; = le Guatemala [DE BOCOURT, H. B. TRISTRAM] ; = le Nicaragua [R. TATE] ; = les Antilles : Porto-Rico [KRUG, F. von MARTENS] et Cuba [R. ARANGO, Dr. GUNDLACH, L. PFEIFFER, etc. . .] où il vit en compagnie d'une espèce très voisine, le *Planorbis (Pierosoma) caribaeus* d'Orbigny.

Le *Planorbis (Pierosoma) tumidus* Pfeiffer est une espèce de taille assez grande, atteignant de 15 à 20 millimètres de diamètre maximum, 13 à 18 millimètres de diamètre minimum et $4\frac{1}{2}$ à 6 millimètres, plus rarement, 7 millimètres de hauteur ² Son test est assez opaque, d'un corné rougeâtre, orné de stries longitudinales serrées et assez fines.

Cette espèce n'est pas sans analogies avec le *Planorbis (Pierosoma) ancylostomus* Fischer et Crosse ³ que le Dr. E. von MARTENS ⁴

¹ L'examen du type de J. MABILLE, conservé dans les Collections du Laboratoire de Malacologie du Muséum National d'Histoire naturelle de Paris, ne laisse pas de doute sur cette identification.

² La forme décrite par J. MABILLE sous le nom de *Planorbis mysarus*, et que nous avons considérée comme synonyme du *Planorbis (Pierosoma) tumidus* Pfeiffer, atteint 28 millimètres de diamètre maximum, 20 millimètres de diamètre minimum et 8 millimètres de hauteur [MABILLE (J.), *Mollusques de la Basse Californie* recueillis par M. DIGUET, *Bulletin société philomatique Paris*, 8^e série, VII, No. 2, 1895, p. 64]. Le type a été recueilli dans la Basse Californie par L. DIGUET.

³ FISCHER (P.) et CROSSE (H.), *Journal de Conchyliologie*, XXVII, p. 341 ; = et : *Etudes sur les Mollusques terr. et fluvial. du Mexique et du Guatemala*, Paris, Impr. nation., II, 1884, p. 63, No. 3, pl. xxxii, fig. 5a-5b.

Le *Planorbis ancylostomus* Fischer et Crosse a été recueilli aux environs de Chiapas et de Vera Cruz [A. SALLÉ].

⁴ MARTENS (Dr. E. von), *Land and Freshwater Mollusca* (Biologia Centrali Americana, London) Avril 1899, p. 388.

considère comme synonyme, retenant seulement la variété *chiapensis* Fischer et Crosse ¹ qu'il subordonne au *Planorbis* (*Pierosoma*) *tumidus* Pfeiffer. Ces coquilles sont, évidemment, très voisines et l'opinion du Dr. E. von Martens est parfaitement défendable; cependant H. CROSSE et P. FISCHER, qui placent le *Planorbis* (*Pierosoma*) *tumidus* Pfeiffer entre le *Planorbis* (*Pierosoma*) *belizensis* Fischer et Crosse ² et le *Planorbis* (*Pierosoma*) *ancylostomus* Fischer et Crosse attribuent à ce dernier quelques caractères assez nets. C'est ainsi que cette coquille montre une face supérieure excavée avec une *partie centrale très enfoncée*, une spire composée de 5 tours convexes, à croissance régulière, "arrondis à la face supérieure, canaliculés et anguleux à la face inférieure"; une ouverture oblique, semi-lunaire, anguleuse inférieurement, entourée d'un péristome mince, "un peu dilaté et parfois subréfléchi." Le type atteint 18 millimètres de diamètre maximum, 15 millimètres de diamètre minimum et 6½ millimètres de hauteur.

P. FISCHER et H. CROSSE comparent leur espèce aux *Planorbis* (*Pierosoma*) *trivolvus* Say ³ et *Planorbis* (*Pierosoma*) *corpulentus* Say ⁴ qui sont très notablement différents. Les mêmes auteurs ajoutent que le *Planorbis* (*Pierosoma*) *sinuosus* Bonnet ⁵ s'en sépare "par le bord supérieur de son ouverture subhorizontal et sa bouche plus transverse, rappelant celle du *Planorbis lentus* Say, mais différente de cette espèce par sa forme anguleuse inférieurement." ⁶ Enfin le *Planorbis* (*Pierosoma*) *ancylostomus* Fischer et Crosse n'est pas non plus sans analogies avec le *Planorbis* (*Pierosoma*) *tumens* Carpenter ⁷ et le *Planorbis* (*Pierosoma*) *tenuis* Dun-

¹ FISCHER (P.) et CROSSE (H.), *loc. supra cit.*, II, 1884, p. 64, pl. xxxiv, fig. 5 [var. *B Chiapensis*]. La variété *chiapensis* Crosse et Fischer est, comme nous le verrons plus loin, une forme *minor* n'ayant que 10½ millimètres de diamètre maximum, 9 millimètres de diamètre minimum et 3 millimètres de hauteur. Elle est plus déprimée que le type, avec une ouverture moins ascendante et moins anguleuse à la base. Elle a été recueillie à Chiapas (Mexique) par A. SALLÉ.

² FISCHER (P.) et CROSSE (H.), *Journal de Conchyliologie*, XXVIII, 1879, p. 342; = et: *loc. supra cit.*, II, 1884, p. 68, No. 7, pl. xxxii, fig. 6, 6a, 6b.

Cette espèce, facile à reconnaître à sa spire composée de 6 tours convexes, étroits et saillants, à croissance régulière et assez lente, séparés par de profondes sutures, — à son ouverture ovale dont le bord supérieur est un peu obliquement relevé, possède d'un test mince, d'un corné pâle presque transparent, orné de stries fines, très serrées, obliquement onduleuses. Elle atteint 17 millimètres de grand diamètre, 14 millimètres de petit diamètre et 4½ millimètres de hauteur. Elle habite le Mexique, dans l'état de Tabasco [A. MORELET]; = le Honduras anglais, à Bélize [DE BOCOURT]; = et le Guatemala, à Coban, San Miguel, Tucucsoa (Etat de Vera Cruz) [DE BOCOURT].

³ SAY (TH.), Article *Conchology*, *American Edition of the Nicholson's Encyclopedia of Arts and Sciences*, First Edition, Philadelphia, 1816, II, pl. ii, fig. 2.

⁴ SAY (TH.), *Narrative of an Expedition to the Source of the St. Peter's River*, etc., under the Command of Major STEPHEN H. LONG, II, Appendix, 1824, p. 262, pl. xv, fig. 9 [non: G. W. BINNEY, A. A. GOULD, HALDEMAN].

⁵ BONNET (C.), *Revue et Magasin de Zoologie*, 1864, p. 280, pl. xxii, fig. 3. Cette espèce est douteuse. G. W. TRYON (*American Journal of Conchology*, I, 1895, p. 183) l'identifie au *Planorbis glabratus* Say [*Journal Academy Natural Sciences of Philadelphia*, I, 1818, p. 280].

⁶ FISCHER (P.) et CROSSE (H.), *loc. supra cit.*, II, 1884, p. 64.

⁷ CARPENTER (P.), *Catalogue Mazatlan Shells*, 1857, p. 81 = Figuré d'abord par G. W. BINNEY (*Land and Freshwater Shells of North America*, II, 1865, p. 106, fig. 180) puis par P. FISCHER et H. CROSSE [*loc. supra cit.*, II, 1884, p. 62, pl. xxxiii, fig. 3 et 3a] qui insistent sur le polymorphisme de l'ouverture de cette espèce

ker¹. Il se sépare du premier par son test plus délicat, plus mince, plus finement strié; par son enroulement différent avec un dernier tour proportionnellement moins élevé; par son ouverture moins anguleuse et par sa taille plus considérable, le *Planorbis* (*Pierosoma*) *tumens* Carpenter n'atteignant que 12 millimètres de diamètre maximum, 10 millimètres de diamètre minimum et 6 millimètres de hauteur. Les affinités avec le *Planorbis* (*Pierosoma*) *tenuis* Dunker sont assez grandes pour que le DR. E. von MARTENS² ait subordonné la variété *Strebeli* Fischer et Crosse³ à ce dernier *Planorbe*. La variété *Strebeli* Fischer et Crosse est, en effet, une coquille de grande taille (diamètre maximum: 22½ millimètres, diamètre minimum: 16¾ millimètres, hauteur: 11 millimètres; hauteur de l'ouverture: 12 millimètres) avec un dernier tour renflé, canaliculé en dessous, et une ouverture très dilatée, ascendante, fortement anguleuse à la base, *bordée par un labre dilaté et parfois réfléchi*. Ces derniers caractères se rencontrent souvent chez le *Planorbis* (*Pierosoma*) *tenuis* Dunker et, notamment, chez la variété *Uhdei* von Martens⁴.

Le *Planorbis* (*Pierosoma*) *tumidus* Pfeiffer est parfois de taille beaucoup plus petite, mesurant seulement de 14 à 16 millimètres de diamètre maximum, 11 à 12 millimètres de diamètre minimum et 6 millimètres de hauteur. Cette forme *minor*, qui habite égale-

"... la forme de l'ouverture [présente] des différences considérables. Celle-ci est plus ou moins oblique; son bord supérieur est tantôt relevé, tantôt subhorizontal: son bord inférieur est anguleux ou simplement arqué; le péristome est plus ou moins renversé et épaissi intérieurement; mais la taille est toujours assez faible comparativement aux *Planorbis tenuis*, *ancylostomus*, *lentus*, etc..." [*loc. supra cit.*, II, 1884, p. 63].

¹ DUNKER (W.), *Limnæacea*, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1856, p. 45, No. 11, taf. ix, fig. 14 à 19 et taf. xvi, fig. 22 à 25 [= *Planorbis fragilis* DUNKER, *loc. supra cit.*, 1856, p. 46, taf. x, fig. 41 à 43 (jeunes)]. Ce *Planorbe* est très répandu au Mexique [H. CROSSE et P. FISCHER, F. DEPPE et C. A. UHDE, A. HEILPRIN, H. HÖGE, Major RICH, SCHUMANN, DR. C. J. W. SCHIEDE et DAVID, SEEMANN, H. STREBEL, etc....] est très polymorphe, aussi a-t-il été décrit un grand nombre de variétés dont les principales sont:

Variété *Boucardi* CROSSE et FISCHER [*loc. supra cit.*, II, 1884, p. 61, pl. xxxii, fig. 3a—3b].—Mexique Central [A. BOUCARD, A. HEILPRIN].

Variété *juvenilis* E. von MARTENS [*loc. supra cit.*, 1899, p. 384] (= *Planorbis solidus* WEIGMANN, non *Planorbis solidus* DUNKER; = *Planorbis tenuis* var., STREBEL, *Beitrag zur Kenntniss der Fauna Mexican.*, 1873, p. 42, taf. v, fig. 21 c.).—Mexique Central [F. DEPPE, H. STREBEL].

Variété *applanatus* E. von MARTENS (*loc. supra cit.*, 1899, p. 384, pl. xxi, fig. 3).—Mexique Central [C. A. UHDE].

Variété *Uhdei* E. von MARTENS [*loc. supra cit.*, 1899, p. 385, pl. xxi fig. 2] (= *Planorbis tenuis*, variété, MARTENS, *Malakozool. Blätter*, XII, 1865, p. 65).—Mexique Central [C. A. UHDE].

Variété *exaggeratus* E. von MARTENS (*loc. supra cit.*, 1899, p. 385, (non figurée)) = *Planorbis tenuis*, variété, PILSBRY (*Proceedings Academy Natural Sciences of Philadelphia*, 1891, p. 322, pl. xv, fig. 4).—Le Mexique Central [A. HEILPRIN].

Et, enfin, la variété *Strebeli* dont il sera question plus loin.

² MARTENS (DR. E. von), *loc. supra cit.*, Avril 1899, p. 385.

³ FISCHER (P.) et CROSSE (H.), *loc. supra cit.*, II, 1884, p. 63 et p. 64 (var. *Strebeliana*) [= *Planorbis trivolvus*? *Planorbis corpulentus*? STREBEL, *Beitrag zur Kenntniss der Fauna Mexican.*, 1873, p. 39, taf. v, fig. 19 (non: *Planorbis trivolvus* Say; non: *Planorbis corpulentus* Say). Cette variété habite les environs de Vera Cruz (Mexique) [H. STREBEL].

⁴ MARTENS (DR. E. von), *loc. supra cit.*, Avril 1899, p. 385, pl. xxi, fig. 2.

ment le Mexique et le Guatemala, a été figurée par W. DUNKER¹ et H. STREBEL² sous le nom de *Planorbis tumidus*. Il faut également y rapporter le *Planorbis intermedius* Philippi³ et sa variété *minor* Clessin⁶ et, peut-être, le *Planorbis capillaris* Beck⁶. Enfin le *Planorbis guatemalensis* Clessin⁷ correspond encore à cette même forme *minor*⁸.

Quant à la variété *chiapasensis* Fischer et Crosse, c'est une forme *minor* du *Planorbis tumidus* Pfeiffer qui se distingue, en outre, par sa forme plus déprimée, sa face inférieure carénée, son ouverture peu dilatée transversalement, à peine ascendante en haut, subanguleuse à la base. Elle a été découverte à Chiapas (Mexique) par A. SALLÉ.

Planorbis (Pierosoma) caribaeus d'Orbigny.

Pl. I, fig. 10, 11 et 12.

- 1853. *Planorbis caribaeus* D'ORBIGNY, in: RAMON DE LA SAGRA, *Histoire physique, politique, natur... île de Cuba*, p. 193, No. 112, pl. xiii, fig. 17 à 19.
- 1856. *Planorbis tumidus* DUNKER, in: MARTINI et CHEMNITZ, *Systemat. Conchylien Cabinet*, 2^e Edit., XVII, Nürnberg, p. 39, No. 4 (part).
- 1886. *Planorbis caribaeus* CLESSIN, *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, p. 156, No. 136, taf. xxiii, fig. 3.
- 1890. *Planorbis Caribaeus* CROSSE, *Journal de Conchyliologie*, XXXVIII, p. 260, No. 378.
- 1891. *Planorbis caribaeus* PILSBRY, *Proceedings Academy Natural Sciences of Philadelphia*, p. 322.
- 1899. *Planorbis (Helisoma) caribaeus* MARTENS, *Land and Freshwater Mollusca*, *Biologia Centrali-Americana*, p. 387, No. 4 (part).

LOCALITÉ :

Antilles: Cuba, sans localité précise; 4 exemplaires, No. P. 104. B.

¹ DUNKER (DR W.), in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., xvii, Nürnberg, 1856, p. 39. taf. xvi, fig. 18—19, et CLESSIN (S.), *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *id.*, XVII, 1886, p. 196, No. 194.

² STREBEL (H.), *loc. supra cit.* 1873, p. 41, taf. V, fig. 20 a seulement.

³ PHILIPPI, in: DUNKER, *loc. supra cit.*, XVII, 1856, p. 39, taf. xvi, fig. 18—19 et CLESSIN (S.), *loc. supra cit.*, 1886, p. 196, No. 194.

⁴ Non: *Planorbis intermedius* DE CHARPENTIER.

⁵ CLESSIN (S.), in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, 1886, p. 196

⁶ BECK (H.), *Index Molluscorum*, 1837, p. 119 (sans description).

⁷ CLESSIN (S.), in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, 1886, p. 209, No. 214, taf. xxxii, fig. 7.

⁸ Le nom de *guatemalensis* étant le plus ancien ne faisant pas double emploi (le *Planorbis capillaris* Beck n'ayant jamais été ni décrit, ni figuré) doit être conservé à cette variété qui se nommera:

Planorbis (Pierosoma) tumidus Pfeiffer, variété *guatemalensis* Clessin.

Le Muséum de Paris possède sous le nom de *Planorbis caribaeus* d'Orbigny variété *guatemalensis* Clessin, deux exemplaires de cette coquille provenant du Guatemala et adressés par le Doct. HOLL. Ils se rapportent incontestablement à la forme *minor* du *Planorbis tumidus* Pfeiffer dont nous venons de parler.

DISTRIBUTION GÉOGRAPHIQUE.

Primitivement découverte à l'île de Cuba par RAMON de la SAGRA, cette espèce a été retrouvée, dans l'Amérique Centrale, en diverses localités du Mexique [DR CANDÉ, A. SALLÉ, H. STREBEL, etc....].

Coquille déprimée, très concave en dessus, presque plane en dessous; spire composée de 5—6 tours très convexes comprimés en dessus, convexes et subcarénés en dessous, à croissance médiocre, régulière; dernier tour assez grand, dilaté à l'extrémité (il s'élargit à partir du dernier tiers de son développement); sutures profondes; ouverture oblique, irrégulièrement subpentagonale, bien anguleuse à la base; bords convergents et assez écartés.

Diamètre maximum: $13\frac{1}{2}$ millimètres; diamètre minimum: $11\frac{1}{4}$ millimètres; hauteur maximum: 5 millimètres; diamètre de l'ouverture: $5\frac{1}{2}$ millimètres; hauteur de l'ouverture: 5 millimètres.

Test un peu mince, médiocrement fragile, subtransparent, d'un corné brun plus clair en dessous qu'en dessus, orné de stries longitudinales fines, serrées, un peu irrégulières, obliquement onduleuses, plus délicates en dessous qu'en dessus.¹

Presque tous les auteurs ont considéré le *Planorbis* (*Pierosoma*) *caribaeus* d'Orbigny comme synonyme du *Planorbis* (*Pierosoma*) *tumidus* Pfeiffer. Cette opinion est probablement exacte; cependant l'espèce de A. d'Orbigny est de taille plus grande et la forme de son ouverture est différente. En réalité ces deux Planorbes représentent et remplacent, à l'île de Cuba et dans l'Amérique Centrale, le *Planorbis* (*Pierosoma*) *trivoltis* Say si répandu aux États-Unis.² L'affinité de ces espèces est évidente et l'ornementation sculpturale identique; elle est seulement plus délicate chez le *Planorbis* (*Pierosoma*) *tumidus* Pfeiffer et *Planorbis* (*Pierosoma*) *caribaeus* d'Orbigny.

Planorbis (**Pierosoma**) **affinis** C. B. Adams.

Pl. I, fig. 13, 14 et 15.

- 1855. *Planorbis affinis* C. B. ADAMS, Conchol. Contrib., p. 44.
- 1878. *Planorbis affinis* SOWERBY, Monograph of the genus *Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. iv, fig. 28 (mauvaise).
- 1886. *Planorbis affinis* CLESSIN, Die Familie der Limnæiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 132, No. 106, taf. xx, fig. 5.
- 1890. *Planorbis affinis* CROSSK, *Journal de Conchyliologie*, XXXVIII, p. 260, No. 376.

¹ La diagnose originale de A. D'ORBIGNY [*loc. supra cit.*, 1853, p. 193, No. 112] est la suivante :

"Pl. testa opaca, cornea, transversim exilissime striata, superne concava, subtus plano-concava, subcarinata; aufractibus sextis convexis; inferne carinatis; suturis excavatis; apertura obliqua, subtus depressa.

"Diam. : 1 mm., haut. : 6 mm."

² A. D'ORBIGNY [*loc. supra cit.*, 1853, p. 194] avait déjà saisi cette analogie. Il dit, en effet : "Cette espèce nous offre un passage entre le *Planorbis tenagophilus* d'Orbigny et le *Planorbis trivoltis* Say."

LOCALITÉ:

Jamaïque: sans indication précise; un exemplaire; No. P. 104. B.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce vit, dans les Antilles, à l'île de la Jamaïque et à celle de Cuba [R. ARANGO, DR. GUNDLACH].

Coquille de taille moyenne, profondément ombiliquée en dessus, presque plane, subconcave en dessous; spire composée de 4—4½ tours convexes en dessus, à peine convexes et nettement anguleux en dessous, à croissance assez rapide, régulière; dernier tour grand, dilaté dans sa partie tout à fait terminale; sutures très profondes en dessus, superficielles en dessous; ouverture peu oblique, transverse, anguleuse à la base avec le bord supérieur subrectiligne dans une direction légèrement ascendante; péristome simple, tranchant; bords marginaux réunis par une callosité blanche bien marquée.

Diamètre maximum: 14 millimètres; diamètre minimum: 11 millimètres; hauteur: 6 millimètres; diamètre de l'ouverture: 5½ millimètres, hauteur de l'ouverture: 5 millimètres.

Test assez solide, subopaque, d'un brun marron plus ou moins foncé, quelquefois d'un roux corné, assez brillant, orné de stries longitudinales un peu fines, irrégulières, subéquidistantes, obliquement onduleuses, à peine plus fines en dessous, plus fortes et plus irrégulières aux environs de l'ouverture.

Cette coquille est certainement très voisine des *Planorbis* (*Pierosoma*) *tumidus* Pfeiffer et *Planorbis* (*Pierosoma*) *caribaeus* d'Orbigny. Il est même probable que ces trois Planorbes appartiennent à une seule espèce remplaçant, dans les Antilles et l'Amérique Centrale, le *Planorbis* (*Pierosoma*) *trivolvus* Say de l'Amérique du Nord.¹ D'ailleurs le système sculptural de l'espèce de SAY est le même que celui du *Planorbis* (*Pierosoma*) *affinis* Adams; il est seulement plus délicat chez cette dernière espèce.

La figure donnée par le Doct. S. CLESSIN², n'est pas très exacte: la coquille est trop épaisse proportionnellement à son diamètre maximum, la carène qui garnit les tours à la face inférieure est trop fortement saillante et l'ouverture est mal dessinée. De plus, le coloris n'est pas heureux: il est, à la fois, trop foncé et trop gris. L'exemplaire que je représente (Pl. I, fig. 13 à 15) n'est pas typique: son enroulement est parfaitement normal, mais son ouverture est un peu trop relevée.

¹ Ces quatre Planorbes montrent exactement le même mode d'enroulement des tours de spire, mais la coquille reste constamment plus déprimée—moins haute par rapport au diamètre maximum—chez les *Planorbis tumidus* Pfeiffer, *Planorbis caribaeus* d'Orbigny et *Planorbis affinis* Adams que chez le *Planorbis trivolvus* Say.

² CLESSIN (S.), *loc. supra cit.* XVII, 1886, taf. xx, fig. 5.

§ III.

Planorbis (Pierosoma) tenagophilus d'Orbigny.

1835. *Planorbis tenagophilus* D'ORBIGNY, Synopsis terr. et fluviatil. Molluscorum Americam meridion., *Magasin de Zoologie de GUÉRIN-MÉNEVILLE*, p. 26, No. 5.
1843. *Planorbis tenagophilus* D'ORBIGNY, *Voyage Amérique méridionale*, V, 3^e partie, *Mollusques*, p. 347, taf. xlv, fig. 9 à 12.
1850. *Planorbis tenagophilus* MENKE, *Zeitschrift für Malakozoologie*, p. 163, No. 5.
1856. *Planorbis tenagophilus* DUNKER, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 40, No. 5, taf. v, fig. 22-23-24.
1868. *Planorbis tenagophilus* MARTENS, *Malakozoolog. Blätter*, p. 186, No. 28.
1873. *Planorbis tenagophilus* MARTENS, *Die Binnemollusken Venezuela's, Festschrift... Gesellschaft Naturforsch.-Freunde Berlin*, p. 196.
1878. *Planorbis tenagophilus* SOWERBY, Monograph of the genus *Planorbis*, in : T. REEVE, *Conchologia Iconica*, London, XX, pl. vi, fig. 51.¹
1878. *Planorbis tenagophilus* NEVILL, *Handlist Mollusca Indian Museum, Calcutta*, I, p. 241, No. 2.

LOCALITÉ :

République Argentine : Corrientes ; un exemplaire.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe—très commun, principalement dans les lacs—occupe un area considérable s'étendant depuis la province de Corrientes (République Argentine) jusqu' à celle de Chiquitos (Bolivie). Il vit également au sud du Brésil, notamment dans la province de Porto Alegre [DR. R. HENSEL].

Le type décrit par A. D'ORBIGNY est une coquille mesurant 16 millimètres de diamètre maximum et 9 millimètres de hauteur ; mais il existe des individus beaucoup plus grands, puisque le DR. E. von MARTENS signale un échantillon du Musée de Berlin atteignant 19 millimètres de diamètre maximum, 15 millimètres de diamètre minimum, mais seulement 7 millimètres de hauteur.²

L'exemplaire appartenant au Musée de Calcutta est de taille plus faible : 13½ millimètres de diamètre maximum, 11½ millimètres de diamètre minimum et 6 millimètres de hauteur. L'ouverture a 6 millimètres de diamètre maximum et 6 millimètres de hauteur. Le test est mince, un peu fragile, d'un corné fauve légèrement brillant surtout en dessus, plus clair en dessous. En dessus les stries sont obliquement onduleuses, fines, serrées, subégales, sauf au dernier tour où elles sont moins régulières ; elles sont, en dessous, plus fines, plus serrées et moins obliques.

¹ G. SOWERBY indique, par erreur, à propos de cette espèce : " D'ORBIGNY, *Voy. Amér. Méridionale*, pl. xlv, fig. 17—20. "

² MARTENS (DR. E. von), *Ueber südbrasilische Land-und Süsswasser-mollusken*, *Malakozoolog. Blätter*, XV, 1868, p. 189.

Ce Planorbe a d'incontestables analogies avec le *Planorbis* (*Planorbina*) *lugubris* Wagner qu'il remplace dans le sud du Brésil et l'ouest de l'Amérique méridionale. Ce rapprochement qui a été longuement traité, à deux reprises, par le DR. E. von MARTENS¹, n'avait cependant pas échappé à A. D'ORBIGNY. Mais ce dernier compare son espèce au *Planorbis olivaceus* de Spix [= *Planorbis ferrugineus* DE SPIX²] et ajoute qu'elle est " beaucoup plus petite, moins déprimée, également concave des deux côtés tandis que l'espèce du naturaliste allemand est plane en dessus; enfin elle est carénée des deux côtés et, dans l'ombilic, les tours de spire sont saillants sur la partie carénée, ce qui n'a jamais lieu dans l'autre espèce."³ La présence des carènes conduit à classer ce Planorbe dans le sous-genre *Pierosoma*.⁴

Planorbis (*Pierosoma*) *peruvianensis* Broderip.

- 1832. *Planorbis peruvianus* BRODERIP, *Proceedings Zoological Society of London*, p. 125.
- 1835. *Planorbis peruvianus* D'ORBIGNY, *Synopsis terr. fluviat. Molluscorum Americam meridion.*, *Magasin de Zoologie de GUÉRIN-MÉNEVILLE*, p. 26, No. 4.
- 1837. *Planorbis peruvianus* BECK, *Index Molluscorum*, p. 120.
- 1843. *Planorbis peruvianus* D'ORBIGNY, *Voyage Amérique méridionale*, V, 3^e partie, *Mollusques*, p. 345.
- 1856. *Planorbis peruvianus* DUNKER, in: MARTINI et CHERMITS, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 44, No. 10, taf. vi, fig. 7 à 10.
- 1878. *Planorbis peruvianus* SOWERBY, *Monograph of the genus Planorbis*, in: L. REEVE, *Conchologia Iconica*, London, XX, pl. i, fig. 3.

LOCALITÉ :

Pérou : Lac Titicaca ; deux exemplaires ; No. P. 105 B.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe est seulement connu du Pérou, notamment du lac Titicaca, de la plaine de Trujillo (=Truxillo) [BRODERIP, H. CUMING] et des environs de Callao et de Lima [A. D'ORBIGNY, R. PHILIPPI].

Dans la volume des Mollusques de la grande collection publiée à Londres sous le titre général de *Biologia Centrali-Americana*, le DR. E. von MARTENS écrit :

"*P. peruvianus*. Brod., is, according to the specimen in Berlin Museum, very near this species [il s'agit ici du *Planorbis tenuis*

¹ MARTENS (DR. E. von), *loc. supra cit.*, XV, 1868, p. 186 à 189; et: *Die Binnenmollusken von Venezuela's, Festschrift. Gesellsch. Naturforsch. Freunde Berlin*, 1873, p. 196.

² Espèce voisine du *Planorbis* (*Planorbina*) *lugubris* Wagner. Cf.: *ante*, p. 46.

³ ORBIGNY (A. D'), *Voyage dans l'Amérique méridionale*, V, 3^e partie, *Mollusques*, Paris, 1843, p. 347.

⁴ Cf. précédemment, p. 44, de ce Mémoire, au sujet de ce rapprochement et de l'opinion de A. LUTZ qui considère le *Planorbis* (*Pierosoma*) *tenagophilus* d'Orbigny comme synonyme du *Planorbis* (*Planorbina*) *olivaceus* De Spix.

Dunker], but it is more compressed, with more feeble striae, and of a pale colour.”¹

Cette assertion est exagérée: l'analogie signalée par E. von MARTENS existe certainement, mais il est impossible de confondre ces deux espèces. Le *Planorbis peruvianensis* Broderip est une coquille beaucoup plus fortement carénée, aussi bien en dessus qu'en dessous, que le *Planorbis tenuis* Dunker. De plus, les caractères de son ouverture sont très différents. Par contre, A. d'ORBIGNY a décrit et figuré deux Planorbes abondants dans le lac Titicaca et qui sont voisins de l'espèce de BRODERIP. L'un est le *Planorbis (Taphius) montanus* d'Orbigny,² de forme plus déprimée et à tours moins fortement carénés; l'autre est le *Planorbis (Taphius) andecolus* d'Orbigny,³ n'ayant que 13 millimètres de diamètre maximum, mais atteignant 8 millimètres de hauteur, possédant des carènes très marquées et une ouverture fortement évasée.

Les échantillons appartenant au Musée de Calcutta sont de taille moyenne: 10 et 12 millimètres de diamètre maximum, 8½ et 9 millimètres de diamètre minimum, enfin 3½ et 4½ millimètres de hauteur.⁴ Les carènes supérieure et inférieure du dernier tour sont très saillantes. Le test est solide, médiocrement épais; il a, en très grande partie, perdu son épiderme et les lambeaux qui en restent sont d'un brun roux. En dessus, les stries, bien que fines, ont une apparence subcostulée; elles sont assez serrées, élevées, irrégulières, inégalement espacées, visibles jusqu'au fond de la cavité ombilicale; elles sont, en dessous, de même apparence mais plus régulières, un peu plus serrées, visibles également jusqu'au fond de la cavité ombilicale.

Sous-genre *Taphius* H. et A. Adams, 1855.

1855. *Taphius* H. et A. ADAMS, *Genera of Recent Mollusca, etc.*, II, London, p. 262 [type: *Planorbis andecolus* d'Orbigny].

1886. *Taphius* CLESSIN, Die Familie der Limnaeiden, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 33, No. 3.

1899 (Avril). *Taphius* MARTENS, Land and Freshwater Mollusca (*Biologia Centrali-Americana*), London, p. 396.

Coquille de taille moyenne, très ombiliquée en dessous; spire composée d'un petit nombre de tours à croissance rapide, le dernier très dilaté vers l'ouverture et descendant à son extrémité; ouverture fortement oblique.

Type: *Planorbis andecolus* d'Orbigny.

¹ MARTENS (DR. F. von), Land and Freshwater Mollusca, *Biologia Centrali-Americana*, London, Avril 1899, p. 384.

² ORBIGNY (A. D'), Synopsis terr. et fluviatil. Molluscorum Americani Meridionali, Magasin de Zoologie de GUFREIN-MÉNEVILLE, 1835, p. 26, No. 3; et: *Voyage Amérique méridionale*, V, 3^e partie, Mollusques, Paris, 1843, p. 345, pl. xlv, fig. 5 à 8.

³ ORBIGNY (A. D'), loc. supra cit., 1835, p. 26, No. 2; et: loc. supra cit., Paris, 1843, p. 346, pl. xlv, fig. 1 à 4.

⁴ Les grands exemplaires du *Planorbis peruvianensis* Broderip ont 19 millimètres de diamètre maximum et 8 millimètres de hauteur.

Les *Taphius* vivent dans l'Amérique Centrale [une seule espèce: *Planorbis (Taphius) supronus* Martens] et, surtout, dans l'Amérique du sud; ils remplacent, dans ces contrées, les *Helisoma* de l'Amérique du Nord.

Planorbis (Taphius) pronus von Martens.

Pl. II, figs. 3—5.

1873. *Planorbis pronus* MARTENS, Binnemollusken Venezuela's, *Festschrift . . . Gesellsch. Naturforsch. Freunde Berlin*, p. 42, taf. ii, fig. 5a—5b—5c—5d—5e et 5f.
 1886. *Planorbis pronus* CLESSIN, Die Familie der Limnaeiden, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 178, No. 168, taf. xxiv, fig. 9.

LOCALITÉ:

Venezuela: sans indication précise de localité; 4 exemplaires [leg. DR. E. von MARTENS].

DISTRIBUTION GÉOGRAPHIQUE.

Cette n'est connue que du Venezuela (lac de Valencia). Une espèce représentative, plus petite (diamètre maximum: 5 millimètres; diamètre minimum: 4 millimètres; hauteur: 2 millimètres) et avec un dernier tour moins dilaté vers l'ouverture, habite le Mexique, dans l'état de Tabasco: elle a été décrite, sous le nom de *Planorbis (Taphius) subpronus*, par le DR. E. von MARTENS.¹

Cette curieuse espèce rappelle les *Planorbis (Helisoma) bica-rinatus* Say du Nord de l'Amérique et *Planorbis (Taphius) ande-colus* d'Orbigny des Andes du Pérou. Elle a été fort bien figurée par le DR. E. von MARTENS et elle présente de nombreuses variations dans la forme de son ouverture, qui est plus ou moins oblique, et dans l'allure du dernier tour, toujours très élargi, mais plus ou moins descendant à son extrémité.²

La taille semble très variable. Le type décrit par le DR. E. von MARTENS mesure 10 millimètres de diamètre maximum, 8 millimètres de diamètre minimum et 5 millimètres de hauteur. Les exemplaires appartenant au Musée d'Histoire naturelle de Calcutta ont les dimensions suivantes:

Diamètre maximum.	Diamètre minimum.	Hauteur totale.	Hauteur de l'ouverture.	Diamètre de l'ouverture.
6 mill.	4 $\frac{3}{4}$ mill.	2 $\frac{1}{2}$ mill.	2 $\frac{1}{2}$ mill.	2 $\frac{1}{2}$ mill.
5 —	4 $\frac{1}{2}$ —	2 $\frac{1}{4}$ —	2 $\frac{1}{4}$ —	2 $\frac{1}{4}$ —
4 $\frac{3}{4}$ —	4 —	2 $\frac{1}{2}$ —	2 —	2 —
4 $\frac{1}{2}$ —	3 $\frac{3}{4}$ —	2 —	2 —	2 —

¹ MARTENS (DR. E. von), Land and Freshwater Mollusca, *Biologia Centrali-Americana*, London, Avril 1899, p. 396, No. 19, pl. xxi, fig. 35.

² Ces variations de forme de l'ouverture sont parfaitement indiquées sur la planche ii, fig. 5a—5f, du travail précité du DR. E. von MARTENS.

Le test est d'un corné très clair, presque blanc, subtransparent; il montre, en dessus, des stries longitudinales obliques, subondulenses, très irrégulières, fines, mais mêlées de quelques stries plus fortes légèrement subcostulées et, en dessous, des stries plus fines, irrégulières et inégales.

Sous-genre *Helisoma* Swainson, 1840.

- 1840. *Helisoma* SWAINSON, *A Treatise on Malacology*, etc., London, p. 347 [Type: *Planorbis bicarinatus* Say].
- 1865. *Helisoma* BINNEY, *Land and Freshwater Shells North America*, II, Washington, p. 112.
- 1880. *Helisoma* FISCHER et CROSSE, *Etudes Mollusques terr. fluviat. Mexique et Guatemala*, Paris, II, p. 60.
- 1886. *Helisoma* CLESSIN, Die Familie der Limnaeiden in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 33, No. 2.
- 1899 (Avril). *Helisoma* MARTENS, *Land and Freshwater Mollusca (Biologia Centrali-Americana)*, p. 381 [= *Planorbis* sensu stricto + *Helisoma* + *Planorbella*].
- 1905. *Helisoma* DALL, *Land and Freshwater Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New-York, p. 81 et p. 84.

Coquille de taille moyenne, relativement haute, spire composée d'un petit nombre de tours à croissance rapide très carénés en dessus et en dessous, ouverture réfléchie.

Type: *Planorbis carinatus* Say.

Les espèces du sous-genre *Helisoma* sont très peu nombreuses. Elles vivent dans les eaux douces de l'Amérique du Nord.

Planorbis (*Helisoma*) *bicarinatus* Say.

- 1817. *Planorbis bicarinatus* SAY, *Nicholson's Encyclop.*, 1^{re} Edit., II Philadelphia, (sans pagin.), No. 2, pl. i, fig. 4 (non *Planorbis bicarinatus* DE LAMARCK¹).
- 1822. *Planorbis bicarinatus* SOWERBY, *The Genera of Shells, Planorbis*, fig. 4.
- 1822. *Helix angulata* RACKETT, *Transactions Linnean Society of London*, XIII, p. 42, pl. v, fig. 1 [non *Helix angulata* BURROW, 1815].
- 1826. *Helix bicarinatus* EATON, *Zoolog. Text-Book*, p. 194 [non: *Helix bicarinata* SOWERBY, 1822].
- 1834. *Planorbis antrosus* CONRAD, *American Journal of Sciences and Arts*, New Haven, (I), XXV, part 2, p. 343.
- 1835. *Planorbis engonatus* CONRAD, *New Fresh Water Shells of the United States, Appendix*, p. 8, pl. ix, fig. 8.
- 1837. *Planorbis bicarinatus* (a major et b minor) BECK, *Index Molluscorum*, p. 118.
- 1838. *Planorbis bicarinatus* POTIEZ et MICHAUD, *Galerie Mollusques Douai*, I, p. 207, pl. xxi, fig. 1 à 3.

¹ E. G. VANATTA (*Planorbis bicarinatus* and *Pleurodonte angulata*, *The Nautilus*, XXIV, No. 12, Boston, April 1911, pp 136—138) rejette, pour cette raison, le nom de *Planorbis bicarinatus* Say pour adopter celui de *Planorbis antrosus* Conrad. Cependant le *Planorbis bicarinatus* DE LAMARCK [*Annales Muséum Hist. natur. Paris*, V, 1804, p. 36; et VIII, 1806, pl. lxii, fig. 3], fossile du bassin de Paris, n'appartient pas au genre *Planorbis* et G. P. DESHAYES [*Descript. Animaux sans vertèbres Bassin de Paris*, II, 1864, p. 438] le classe dans les *Adeorbis* (*Adeorbis bicarinatus*). Dans ces conditions il est absolument inutile de changer le nom de cette espèce universellement connue sous le vocable de *Planorbis bicarinatus* Say.

1844. *Planorbis bicarinatus* HALDEMAN, *Monograph of the Limniades and other Fresh Water Univalve Shells*, p. 6, pl. 1, fig. 1 à 6.
 1844. *Planorbis angistoma* HALDEMAN, *loc. supra cit.*, p. 7.
 1860. *Planorbis angulatus* WOOD, *Index testac. Suppl.* VII, p. 12.
 1861. *Planorbis lautus* H. ADAMS, *Proceedings Zoological Society of London*, p. 145.
 1878. *Planorbis bicarinatus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 241, No. 9.
 1886. *Planorbis bicarinatus* CLESSIN, *Die Familie der Limnaeiden*, in , MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit.: XVII, Nürnberg, p. 56, No. 24, taf. ix, fig. 11 à 13.
 1905. *Planorbis (Helisoma) bicarinatus* DALL, *Land and Fresh Water Mollusks of Alaska*, p. 87, fig. 64.
 1909. *Planorbis bicarinatus* BRYANT WALKER, *The Nautilus*, XXIII, No. 1, Boston, Janvier 1909, p. 1, pl. i, fig. 1 à 12 (type : fig. 3 ; les autres figures correspondent à des variétés).
 1911. *Planorbis antrosus* VANATTA, *The Nautilus*, XXIV, No. 12, Boston, Avril 1911, p. 138.
 1918. *Planorbis antrosus* BRYANT WALKER, *Synopsis Fresh-Water Mollusca North America*, *University of Michigan, Miscellaneous Publications* No. 6, Michigan, p. 95.

LOCALITÉS :

Amérique du Nord : Michigan, sans localité précise [W. A. BROWN] ; = Nebraska, sans localité précise [Prof. W. NEW-COMB].

DISTRIBUTION GÉOGRAPHIQUE.

Ce *Planorbe* habite presque tous les Etats-Unis à l'est des Montagnes Rocheuses, mais surtout dans la région comprise entre les grands lacs et la côte de l'Océan Atlantique. Il vit aussi dans la partie est du Canada.¹

Le *Planorbis (Helisoma) bicarinatus* Say est une des espèces les plus caractéristiques des régions est de l'Amérique du Nord. Il est abondamment répandu dans presque toutes les eaux douces de ces contrées et la seule espèce qui s'en rapproche est le *Planorbis (Helisoma) eucosmius* Bartsch² recueilli, en compagnie d'une variété *Vaughani* Bartsch,³ dans un étang des environs de Wilmington (Caroline du sud).

Par contre, le *Planorbis (Helisoma) bicarinatus* Say est assez polymorphe, ce qui a permis d'établir un grand nombre de variétés :

Variété *unicarinatus* HALDEMAN [Monograph Freshwater Univalve Shells, 1844, p. 7. Figurée par BRYANT WALKER, *loc. supra cit.*, XXIII, No. 1, Mai 1909, p. 3, pl. i, fig. 6, 7, 8 ; =

¹ BRYANT WALKER a donné une étude très détaillée de la distribution géographique du *Planorbis bicarinatus* Say à laquelle je renvoie le lecteur [Notes on *Planorbis*, II, Pl. *bicarinatus*, *The Nautilus*, XXIII, No. 2, Boston, Juin 1909, pp. 21 à 28, pl. iii (carte de la distribution géographique du *Planorbis bicarinatus* Say)].

² BARTSCH (PAUL), Notes on the Fresh Water Mollusk *Planorbis magnificus* and descriptions of two new forms of the same genus from the Southern States ; *Proceedings United States National Museum*, XXIII, 4 Mars 1908, p. 699, pl. lvii, fig. 1 à 3.

³ BARTSCH (PAUL), *loc. supra cit.*, 4 Mars 1908, p. 699, pl. lvii, fig. 4 à 6 [*Planorbis eucosmius Vaughani*].

Planorbis antrosus unicarinatus BRYANT WALKER, *loc. supra cit.* 1918, p. 96].

Variété *angistomus* HALDEMAN [*loc. supra cit.*, 1844, p. 7 : et : BRYANT WALKER, *loc. supra cit.*, 1909, p. 4, pl. i, fig. 4—5 ; = *Planorbis antrosus angistomus* BRYANT WALKER, *loc. supra cit.*, 1918, p. 95].

Variété *corrugatus* CURRIER [*List of the shells-bearing Mollusca of Michigan*, 1868, p. 8, et : BRYANT WALKER, *loc. supra cit.* 1909, p. 11, pl. i, fig. 10 ; = *Planorbis antrosus corrugatus* BRYANT WALKER *loc. supra cit.*, 1918, p. 95].

Variété *aroostookensis* PILSBRY [*The Nautilus*, VIII, 1875, p. 115 ; et : BRYANT WALKER, *loc. supra cit.*, 1909, p. 7, pl. i, fig. 1 et 2 ; = *Planorbis antrosus aroostookensis* BRYANT WALKER, *loc. supra cit.*, 1918, p. 95].

Variété *striatus* BAKER [*The Nautilus*, XV, 1902, p. 120 ; et : *Transact. Academy Sciences St. Louis*, XVI, 1906, p. 9, pl. i, fig. 11 ; et : BRYANT WALKER, *loc. supra cit.*, 1909, p. 7 ; = *Planorbis antrosus striatus* BRYANT WALKER, *loc. supra cit.*, 1918, p. 96].

Variété *portagensis* BAKER [*The Nautilus*, XXII, 1908, p. 45 ; et : BRYANT WALKER, *loc. supra cit.*, 1909, p. 8, pl. i, fig. 9 ; = *Planorbis antrosus portagensis* BRYANT WALKER, *loc. supra cit.*, 1918, p. 96].

Variété *percarinatus* BRYANT WALKER [*loc. supra cit.*, 1909, p. 6, pl. i, fig. 12 = *Planorbis bicarinatus* variété *major* BRYANT WALKER, *The Nautilus*, VI, 1893, p. 136 (non auct. Americ.) = *Planorbis antrosus percarinatus* BRYANT WALKER, *loc. supra cit.*, 1918, p. 95].

Variété *royalensis* BRYANT WALKER [*loc. supra cit.*, 1909, p. 9 ; pl. i, fig. 11 ; = *Planorbis antrosus royalensis* BRYANT WALKER, *loc. supra cit.* 1918, p. 96].

En dehors de ces variétés bien définies, le *Planorbis bicarinatus* Say montre, comme beaucoup d'espèces fluviatiles, des mutations *major*, *minor*, etc. . . . répandues un peu partout.

Sous-genre *Planorbella* Haldeman, 1842.

- 1842. *Planorbella* HALDEMAN, *A Monograph Limniades and other Fresh Water Shells North America*, IV, p. 14 [type : *Planorbis campanulatus* Say].
- 1861. *Adula* H. ADAMS, *Proceedings Zoological Society of London*, p. 145 (non *Adula* H. et A. ADAMS, 1857) [type : *Planorbis multivolvis* Case].
- 1865. *Planorbella* BINNEY, *Land and Fresh Water Shells North America*, II, p. 109.
- 1869. *Ancoeus* H. ADAMS, *Proceedings Zoological Society of London*, p. 275 [non *Ancoeus* FAUVEL, 1863].
- 1886. *Adula* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 33, No. 4 [type : *Planorbis multivolvis* Case].
- 1886. *Planorbella* CLESSIN, *loc. supra cit.*, XVII, Nürnberg, p. 33, No. 5 [type : *Planorbis campanulatus* Say].
- 1905. *Planorbella* DALL, *Land and Freshwater Mollusks of Alaska, Harriman Alaska Expedition*, Vol. XIII, New-York, p. 82 et p. 85.

Coquille de taille moyenne, assez haute; spire avec de nombreux tours à croissance lente, très serrés les uns contre les autres, le dernier comprimé derrière une ouverture campanulée.

Type: *Planorbis campanulatus* Say.

Le sous-genre *Planorbella* renferme seulement quelques espèces vivant dans l'Amérique du Nord.

Planorbis (Planorbella) campanulatus Say.

- 1821. *Planorbis campanulatus* SAY, *Journal Academy Natural Sciences Philadelphia*, II, p. 166.
- 1841. *Planorbis campanulatus* GOULD, *Report on the Invertebrata of Massachusetts*, p. 204, fig. 133.
- 1843. *Planorbis campanulatus* DE KAY, *Zoology of New York*, part V, *Mollusca*, p. 61, pl. v, fig. 99a et 99b.
- 1844. *Planorbis campanulatus* HALDEMAN, *Monograph of the Limniades and other Fresh Water Univalve Shells*, p. 9, pl. i, fig. 7 à 11.
- 1856. *Planorbis campanulatus* DUNKER, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit. XVII, Nürnberg, p. 52, No. 22, taf. ix, fig. 7, 8, 9 et 10 (forma minor).
- 1865. *Planorbis campanulatus* BINNEY, *Land and Freshwater Shells North America*, II, p. 109, fig. 184.
- 1878. *Planorbis campanulatus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 241, No. 5.
- 1885. *Planorbis complanatus* MILLER CHRISTY, *vide* DALL, *loc. infra cit.*, 1905, p. 90.
- 1905. *Planorbis campanulatus* DALL, *Land and Freshwater Mollusks of Alaska*, p. 90, fig. 70.
- 1918. *Planorbis campanulatus* (et variétés *rudentis* Dall et Smithi Baker) BRYANT WALKER; *Synopsis Fresh-Water Mollusca North America*, etc. . . . *University of Michigan Miscellaneous Publications* No. 6, Michigan, p. 97.

LOCALITÉS :

Etats-Unis ; Etat de Pensylvanie, Delaware County [REV. E. R. BEADLE ; Prof. W. NEWCOMB] ; quelques exemplaires typiques ; = Ohio, sans indication précise de localité [REV. E. R. BEADLE ; Prof. W. NEWCOMB].

DISTRIBUTION GÉOGRAPHIQUE.

La répartition géographique de cette espèce comprend toute la région atlantique, depuis la Floride au sud jusqu'à la baie d'Hudson au nord, sans dépasser, vers l'ouest, le fleuve Mackenzie. Dans le bassin de ce fleuve, le *Planorbis campanulatus* Say ne vit pas au nord du Grand lac de l'Esclave (62° latitude nord), mais il est commun dans toutes les grandes masses lacustres canadiennes : lac Supérieur, lac Winipeg, lac des Bois, etc. . . .

Parmi les échantillons appartenant au Musée d'Histoire naturelle de Calcutta, il en est un qui atteint 17 millimètres de diamètre maximum.¹ Il se rapproche ainsi de la variété *ru-*

¹ Le type mesure 15 millimètres de diamètre maximum, 11 millimètres de diamètre minimum et 6½ millimètres de hauteur.

dentis établie par W. H. DALL¹ pour une coquille plus grande que le type (diamètre maximum : 17½ millimètres ; diamètre minimum : 14 millimètres ; hauteur [épaisseur] : 6 millimètres), beaucoup plus déprimée, pourvue d'un ombilic plus large et, en dessus, d'une *spire dépassant le dernier tour*.²

Une autre variété, décrite par F. C. BAKER³, atteint également une grande taille, puisque son diamètre maximum oscille entre 15 et 18 millimètres, son diamètre minimum entre 11½ et 13½ millimètres et sa hauteur entre 7½ et 9 millimètres. Mais ici la spire est déprimée en entonnoir avec un dernier tour dépassant le plan de la spire ; l'ombilic, moins large, rappelle tout à fait celui du type *campanulatus*⁴ ; enfin la coquille est, proportionnellement, beaucoup moins déprimée dans la variété *Smithi*⁵ que dans la variété *rudentis*.

Quoiqu'il en soit, ces deux variétés rappellent certaines formes d'une espèce beaucoup plus rare, le *Planorbis* (*Planorbella*) *multivolvis* Case⁶ dont la spire est étagée et relativement élevée.

Sous-genre *Tropidiscus* Stein, 1850.

- 1833. *Anisus* FITZINGER, *Systemat. Verzeichniss d. in Erzherzogthum Oesterr. vorkomm. Weichthiere*, p. 11 (part) [non STUDER, 1820 ; non DUJARDIN, 1821].
- 1840. *Spiralina* HARTMANN, *Systematische Übersicht der Europäischen Gattungen* (tableau paru, en 1840, avec la 1^{re} livraison des *Erd- und Süßwasser-Gasteropoden d. Schweiz*, St. Gallen) (*nomen nudum*).
- 1850. *Tropidiscus* STEIN, *Die lebenden Schnecken und Muscheln d. Umgegend Berlins*, Berlin, p. 76 [= *Tropidiscus* + *Diplodiscus*].
- 1855. *Tropidiscus* H. et A. ADAMS, *Genera of recent Mollusca*, etc. . . . , London, II, p. 263.
- 1855. *Gyorbis* MOQUIN-TANDON, *Histoire Mollusques¹ terr. et fluviat. France*, II, Paris, p. 423 et p. 428 [non FITZINGER, 1833].
- 1885. *Tropidiscus* WESTLUND, *Fauna paläarct. region Binnenconchylien* V, p. 69, No. 3.
- 1886. *Tropidiscus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 34, No. 8.
- 1897. *Tropidiscus* WESTERLUND, *Acta Societatis pro Fauna et Flora Fennicae*, XIII, p. 113.
- 1899. *Tropidiscus* SURBECK, *Moll. Fauna Vierwaldstattensis*, *Revue Suisse de Zoologie*, VI, p. 435.

¹ DALL (W. H.), *Land and Fresh water Mollusks of Alaska and adjoining regions; Harriman Alaska Expedition*, New-York, XIII, 1905, p. 90.

² La variété *rudentis* Dall vit dans le lac Kneé, et la rivière Hayes, vers le 55° de latitude nord [E. A. PREBLE].

³ BAKER (F. C.), *A new Planorbis from Michigan*, *The Nautilus*, XXV, No. 10, février 1912, p. 118 [*Planorbis campanulatus Smithi*].

⁴ Chez le *campanulatus*, comme dans la variété *Smithi*, l'ombilic laisse voir 2½ tours de spire ; dans la variété *rudentis* l'ombilic permet de distinguer 3½ tours de spire.

⁵ La variété *Smithi* Baker [dédiée au Prof. FRANK SMITH], vit dans le lac Douglas (Michigan).

⁶ CASE (W.), *American Journal of Sciences*, 2^e série, III, 1847, p. 101, fig. 4—5. Cf., au sujet de cette espèce, BRYANT WALKER, *Notes on Planorbis* I., *The Nautilus*, XXI, No. 6, Octobre 1907, pp. 61—64, pl. viii.

1899. (Avril). *Spiralina* MARTENS, Land and Fresh-Water Mollusca (*Biologia Centrali-Americana*, London), p. 395.

1905. *Tropidiscus* DALL, Land and Fresh Water Mollusks of Alaska, *Harriman Alaska Expedition*, XIII, New-York, p. 82 et p. 85.

Coquille déprimée, de taille médiocre ; spire composée d'un petit nombre de tours à croissance assez rapide, les premiers non carénés, le dernier grand, fortement caréné à la périphérie ; ouverture obliquement ovulaire.

Type : *Planorbis planorbis* Linné.

Les *Tropidiscus* sont des Planorbes très abondamment répandus dans les eaux douces de tout le système paléarctique. Quelques espèces vivent également en Afrique tropicale.

Dans son grand ouvrage sur les Mollusques terrestres et fluviatiles de l'Amérique centrale, le DR. E. von MARTENS adopte, pour ce sous-genre, le nom de *Spiralina* proposé par T. D. W. HARTMANN¹ en 1840, sans description ni indication d'espèce type. Le DR. E. von MARTENS ajoute : "... Comme il [J. D. W. HARTMANN] a distingué tous les autres sous-genres européens de *Planorbis* par différents noms dans le même ouvrage, il est clair qu'il reconnut ce groupe. J'ai moi-même vérifié ce fait, en 1890, en examinant sa collection [déposée] au Musée de Saint Gall, [collection dans laquelle] les *Planorbis depressus* Michaud (une variété du *Planorbis vortex* Linné) et *Planorbis leucostoma* Millet (une espèce très voisine de *Planorbis vortex* Linné)² sont classés sous le nom de *Spiralina*." ³

Cette note est passée presque inaperçue. Elle ne semble d'ailleurs pas, ainsi que je vais le montrer, permettre de rétablir le vocable *Spiralina*.

Dans le bel ouvrage de J. D. W. HARTMANN existe un tableau systématique des genres européens publié, en 1840, avec la première livraison. Nous y lisons :

Planorbis	{	Bathyomphalus.
		Spiralina.
		Planorbis.
		Gyraulius.
		Armiger.
		Hippeutis.
		Segmentina.

Il n'y a pas d'autre précision et aucune indication n'est donnée concernant les espèces choisies comme types des sous-genres. Dans le reste de l'ouvrage nous trouvons les références suivantes :

¹ HARTMANN (J. D. W.), *Erd-und Süßwasser-Gasteropoden der Schweiz*, Saint Gallen, 1840-1844, in—8, XX + 227 pp., 1 tableau + 84 pl. color.

² Le DR. E. von MARTENS fait ici erreur : le *Planorbis leucostoma* Millet (*Mollusques Maine-et-Loire*, Angers, 1813, p. 16, No. 7) est synonyme du *Planorbis (Paraspira) rotundatus* Poiret.

³ MARTENS (DR. E. von), Land and Freshwater Mollusca (*Biologia Centrali-Americana*, London), Avril 1899, p. 395, note infra paginale.

(*Planorbis*) *Hippeutis lenticularis*,¹ p. 51—53, et p. 170—172, tab. 13 [I],² fig. 1 à 4, tab. 23 [XI], fig. 1 à 7 et tab. 59, fig. 6 à 13.

(*Planorbis*) *Gyraulus hispidus*,³ p. 89—93, tab. 25 [I], fig. 1 à 6 et tab. 59, fig. 1 à 3.

(*Planorbis*) *Gyraulus lemniscatus*,⁴ p. 93—94, tab. 26 [II], fig. 1 à 4.

(*Planorbis*) *Gyraulus deformis*,⁵ p. 95—97 et p. 118—119, tab. 27 [III], fig. 1 à 5, tab. 35 [XI],⁶ fig. 1 à 6, tab. 36 [XII],⁶ fig. 1 à 7 et tab. 59, fig. 4—5.

(*Planorbis*) *Gyraulus regularis*,⁷ p. 97—98, tab. 28 [IV], fig. 1 à 5.

(*Planorbis*) *Gyraulus carinatus*,⁸ p. 108—111, tab. 31 [VII], fig. 1 à 4.

(*Planorbis*) *Planorbis dubius*,⁹ p. 111—113, et p. 191—192, tab. 32 [VIII], fig. 1 à 11 et tab. 71, fig. 1 à 14.

(*Planorbis*) *Planorbis marginatus*,¹⁰ p. 113—116, tab. 33 [IX], fig. 1 à 7.

(*Planorbis*) *Gyraulus tenellus*,¹¹ p. 116—117, tab. 34 [X], fig. 1 à 5.¹²

Enfin à la dernière ligne de la page 172¹³ apparaît le vocable *Armiger* : "Die schönen Scalariden von Hippieutis lenticularis in der Wittenbacher Pfütze leben in Gemeinschaft mit sehr grossen schönen Armiger cristatus," indication que l'on retrouve à l'Index alphabétique, p. 219 : "*Armiger cristatus* m."

Ainsi restent, comme *nomen nudum*, les trois sous-genres :

Bathyomphalus.

Spiralina.

Segmentina.

Il est évident que J. D. W. HARTMANN connaissait bien les *Bathyomphalus* et les *Segmentina* établis, les premiers en 1837, les seconds en 1817. Restent donc les *Spiralina*. Or, nous venons de voir que J. D. W. HARTMANN considère les quatre espèces suivantes comme faisant partie des *Planorbis* sensu stricto :

¹ = *Planorbis* (*Hippeutis*) *fontanus* Lightfoot.

² Les indications entre crochets [] correspondent au double numérotage des premières livraisons ; par la suite, les planches ont été numérotées d'une manière continue, de 1 à 84.

³ = *Planorbis* (*Gyraulus*) *albus* Müller.

⁴ = *Planorbis* (*Gyraulus*) *albus* Müller, variété *lemniscatus* Hartmann.

⁵ = *Planorbis* (*Gyraulus*) *devians* Porro.

⁶ On lit, au bas des planches 35 [XI] et 36 [XII] : *Gyraulis*, erreur typogr. pro *Gyraulus*.

⁷ = *Planorbis* (*Gyraulus*) *glaber*, Jeffreyss.

⁸ = *Planorbis* (*Tropidiscus*) *carinatus* Müller.

⁹ = *Planorbis* (*Tropidiscus*) *planorbis*, Linné, variété *dubius* Hartmann.

¹⁰ = *Planorbis* (*Tropidiscus*) *planorbis* Linné [= *Planorbis umbilicatus* Müller.]

¹¹ = *Planorbis* (*Gyraulus*) *tenellus* Hartmann, espèce du Tyrol.

¹² J. D. W. Hartmann signale encore : (*Planorbis*) *Gyraulus duplocarinatus* [p. 152—153, tab. 50, fig. 5 à 8] et (*Planorbis*) *Gyraulus vertigo* [p. 154, tab. 50, fig. 1 à 4] dont nous ne nous occuperons pas, ces espèces étant étrangères à la faune européenne.

¹³ A la fin d'une note infra paginale marquée d'un astérisque.

Planorbis carinatus Müller.
Planorbis dubius Hartmann.
Planorbis planorbis Linné.
Planorbis tenellus Hartmann.

Les trois premières espèces sont justement parmi les plus caractéristiques du sous-genre *Tropidiscus* Stein ; quant à la dernière, elle fait partie des *Gyraulus*. Enfin, d'après la note du Dr. E. von MARTENS citée plus haut, J. D. W. HARTMANN classait, dans son sous genre *Spiralina* : le *Planorbis compressus* Michaud et le *Planorbis leucostoma* Millet [= *Planorbis rotundatus* Poirét]. Or, la première de ces espèces est un *Diplodiscus* et la seconde un *Paraspira*. Le sous-genre *Spiralina* n'est donc nullement synonyme de *Tropidiscus* Stein. Tout au plus pourrait-on établir l'égalité suivante, uniquement basée sur l'étude de la collection HARTMANN faite par le Dr E. von MARTENS :

Spiralina = *Diplodiscus* + *Paraspira*.

Dans de telles conditions il est inutile de retenir le nom de *Spiralina* dont la reprise pourrait entraîner des confusions regrettables.

Planorbis (*Tropidiscus*) *planorbis* Linné.

- 1758. *Helix planorbis* LINNÉ, *Systema Naturae*, Ed. X, I, p. 769 [non *Helix planorbis* DA COSTA, 1778; *Test. Britan.*, p. 65, pl. iv, fig. 12, qui se rapporte au *Planorbis* (*Diplodiscus*) *vortex* Linné].
- 1774. *Planorbis umbilicatus* MÜLLER, *Vermium terrestr. et fluviatil. Histor.*, II, p. 160.
- 1789. *Planorbis complanatus* STUDER, *Fauna Helvet.*, in : COXE, *Trav. Schwitz*, p. 435 [non DRAPARNAUD].
- 1801. *Planorbis carinatus* var. C. DRAPARNAUD, *Tableau Mollusques France*, p. 46.
- 1805. *Planorbis marginatus* DRAPARNAUD, *Histoire Mollusques France*, p. 45, pl. ii, fig. 11, 12 et 15.
- 1830. *Planorbis turgidus* JEFFREYS, *Transact. Linnean Society London*, XVI, part ii, p. 383.
- 1831. *Planorbis Sheppardi* LEACH, *Brit. Mollus.*, p. 140 [excl. TURTON].
- 1831. *Planorbis rhombeus* TURTON, *Shells Britan.*, p. 108.
- 1851. *Planorbis Linnei* MALM, *Svenska Mollusker*, p. 138.
- 1851. *Planorbis complanatus* DUPUY, *Histoire Mollusques terr. fluviat. France*, p. 445, pl. xxi, fig. 5.
- 1855. *Planorbis complanatus* MOQUIN-TANDON, *Histoire Mollusques terr. fluviat. France*, II, p. 448, pl. xxx, fig. 18 à 28.
- 1875. *Planorbis umbilicatus* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 102, No. 3.
- 1878. *Planorbis* (*Anisus*) *marginatus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 243, No. 21.
- 1882. *Planorbis complanatus* LOCARD, *Prodrome, Catalogue Mollusques terr. fluviat. France*, p. 187.
- 1885. *Planorbis umbilicatus* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 69, No. 8.
- 1886. *Planorbis marginatus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edt., XVII, Nürnberg, p. 74, No. 48, taf. xiii, fig. 17 à 19, 29, à 31 et 36 à 38 (figures mauvaises).

1893. *Planorbis umbilicatus* LOCARD, *Coquilles fluviatiles France*, Lyon et Paris, p. 55, fig. 39—41.
 1913. *Planorbis (Tropidiscus) umbilicatus* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 253, fig. 293 à 295.

LOCALITÉS.

- (a) *Allemagne* : Halle [Collect. G. NEVILL]; No. M. 4103 ;
 = Mansfelder-See, près de Halle [Collect. G. NEVILL]; No. M. 4104.

Autriche : sans indication précise de localité.

France : Aix-en-Provence (Bouches-du-Rhône) ; Alsace, sans indication précise de localité (exemplaires se rapportant à la variété *intermedius* de Charpentier) ; = Bayonne (Basses-Pyrénées) [exemplaires typiques et exemplaires appartenant à la variété *intermedius* de Charpentier] ; = Calais (Pas-de-Calais) ; = Lyon (Rhône) ; = Ajaccio (île de Corse) [exemplaires de la variété *Philippii* de Monterosato].

Irlande : Lac d'Osségor.

Suède : sans indication précise de localité [Prof. A. W. MALM¹].

Suisse : Neuchâtel, un exemplaire se rapportant à la variété *dubius* Hartmann.

- (β) *Algérie* : Fossés de la Maison Carrée, à Alger, exemplaires de la variété *Philippii* de Monterosato.

- (γ) *Perse* : Asûpas [W. T. BLANFORD] ; nombreux exemplaires. .

DISTRIBUTION GÉOGRAPHIQUE.

De tous les *Planorbis* du système paléarctique, le *Planorbis (Tropidiscus) planorbis* Linné est celui dont l'aire de distribution est la plus étendue. Il vit abondamment dans toute l'Europe, aussi bien dans les pays du nord (Suède, Norvège, Russie septentrionale) que dans ceux du sud (Espagne, Portugal, Italie, péninsule des Balkans) ; aussi est-il inutile de rappeler les nombreux auteurs qui en ont fait mention. Mais, tandis que la forme normale se rencontre dans les régions moyennes et septentrionales, l'Europe méridionale est peuplée de variétés de taille plus faible et à carène émoussée dont la plus répandue est la variété *Philippii* de Monterosato.² Ce sont ces mêmes variétés que nous

¹ Sous le nom de *Planorbis Linnei* variété *marginata* Malm [Göteborgs Vet. och Vitt. Samh. Handlingar. III, 1855, p. 137].

² Le *Planorbis (Tropidiscus) planorbis* Linné vit dans toute la péninsule balkanique et dans les îles de l'Archipel, mais presque uniquement sous la forme de variétés plus ou moins voisines de la variété *Philippii* de Monterosato. Beaucoup de ces formes ont été élevées au rang spécifique. Tel est le cas, notamment, des *Planorbis (Tropidiscus) atticus* ROTH [Spicileg. Mollusc. in: Malakozool. Blätter, 1855, p. ; et J. R. BOURGUIGNAT, Catalogue Mollusques, Saulcy Orient, 1855, p. 55, pl. II, fig. 35—37] (Grèce et Thessalie) ; *Planorbis (Tropidiscus) arthusae* CRESSIN [Malakozool. Blätter, N. F., I, 1879, p. 5, taf. I, fig. 3 ; et : Die Familie

retrouvons au Maroc. [P. PALLARY¹], en Algérie [J. R. BOURGUIGNAT²], en Tunisie [A. LETOURNEUX et J. R. BOURGUIGNAT³] et jusqu'en Egypte [P. PALLARY⁴].

En Asie, le *Planorbis (Tropidiscus) planorbis* Linné et ses variétés ont une aire de dispersion considérable: nous le trouvons dans toute l'Asie Antérieure, y compris le Turkestan, la Perse et l'Afghanistan [DR. O. BOETTGER,⁵ A. ISSEL,⁶ etc. . . .⁷] et il s'avance, en Sibérie, jusqu'au lac Baïkal [C. A. WESTERLUND⁸].

Parmi les nombreux échantillons de cette espèce appartenant au Musée d'Histoire naturelle de Calcutta, il en est qui se rapportent à quelques unes des variétés dont nous parlons plus loin. Les plus intéressants des exemplaires typiques sont ceux du lac d'Osségor (Irlande) dont la taille varie seulement entre 5 et 7 millimètres de diamètre maximum et quelques individus recueillis en Autriche, malheureusement sans indication de localité précise, dont la taille atteint 20 millimètres de diamètre maximum et 16-17 millimètres de diamètre minimum.

De tous les Planorbes européens, le *Planorbis (Tropidiscus) planorbis* Linné est celui dont le polymorphisme est le plus étendu. Ce polymorphisme porte sur la taille, sur le mode d'enroulement des tours de spire et, principalement, sur la place et l'acuité de la carène qui ceint le dernier tour. Ces diverses catégories de variations peuvent, d'ailleurs, exister simultanément; il en résulte un polymorphisme diffus donnant à la coquille des aspects fort divers. Je vais rapidement passer en revue ces principales modifications.

der Limnaeiden, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1886, p. 82 (*Planorbis alticus* var. *Arethusae*). Ces divers Planorbes doivent être considérés comme synonymes du *Planorbis (Tropidiscus) planorbis* Linné.

¹ PALLARY (P.), Quatrième Contribution étude faune Malacologique Nord-ouest Afrique; *Journal de Conchyliologie*, LII, 1904, p. 54 (sous la forme: Variété *Philippii* de Monterosato).

² BOURGUIGNAT (J. R.), *Malacologie terr. fluviat. Algérie*, II, Paris, 1864, p. 151.

³ LETOURNEUX (A.) et BOURGUIGNAT (J. R.), *Prodrome Malacolog. terr. fluviat. Tunisie*, Paris, Impr. nation., 1887, p. 134 (sous forme des variétés *submarginatus* de Christophori et Jan et *Philippii* de Monteros.).

⁴ PALLARY (P.), Catalogue faune Malacologique Egypte. *Mémoires Institut égyptien*, Le Caire, Nov. 1909, p. 56 (sous la forme: variété *Philippii* de Monterosato).

⁵ BOETTGER (DR. O.) Die Binnenmollusken Transkaspiens und Chorassan, *Zoologische Jahrbüch.*, IV, 1899, p. 966.

⁶ ISSEL (A.), Dei Molluschi raccolti della Missione Italiana in Persia, *Memorie d. Reale Accadem. delle Scienze di Torino*; ser. II, t. XXIII, 1865, fig. 44.

⁷ De nombreux Planorbes de l'Asie Antérieure ont été décrits qu'il faut rapporter, comme variétés—et quelquefois même comme synonymes—un *Planorbis (Tropidiscus) planorbis* Linné. Tel est le cas, notamment, des *Planorbis (Tropidiscus) Sieversi* MOUSSON (*Journal de Conchyliologie*, 1873, p. 221, pl. vii, fig. 9) et *Planorbis (Tropidiscus) antiochianus* LOCARD (*Malacologie lacs Tibériade, Antioche et Homs, Archives Muséum Hist. natur. Lyon*, III, 1883, p. 68, pl. xxiii, fig. 5-6). On trouvera une étude détaillée des formes asiatiques du *Planorbis (Tropidiscus) planorbis* Linné ainsi que des renseignements sur la répartition géographique de ces formes, dans mon mémoire, dont l'impression s'achève en ce moment: *Etude sur les Mollusques terr. et fluviat. recueillis par M. HENRI GADEAU DE KERVILLE pendant son voyage en Syrie*.

⁸ WESTERLUND (C. A.), *Sibiriens Land-och Sötvatten-Mollusker*, Stockholm, 1877, p. 108.

[a] POLYMORPHISME DE TAILLE.

La forme normale mesure de 12 à 20 millimètres de diamètre maximum, mais il existe une mutation *major* Westerlund¹ chez laquelle la coquille atteint de 24 à 25 millimètres de diamètre maximum. La variété *minor* (coquille de 8 à 10 millimètres de diamètre maximum) n'est pas rare ; il n'en est pas de même de la variété *pumilus* Germain,² petite coquille ayant, bien adulte, seulement 1½ à 2½ millimètres de diamètre maximum et ¾—1 millimètre de hauteur. Le test est mince, fragile, transparent et d'un corné blond. Ce *Planorbis*, qui est rare,³ ne doit pas être confondu avec une espèce voisine, le *Planorbis* (*Tropidiscus*) *Arnouldi* Germain⁴ qui se distingue du *Planorbis* (*Tropidiscus*) *planorbis* Linné : par sa taille bien plus faible (diamètre maximum : 2½—4½ millimètres ; hauteur : 1—1½ millimètre), son dernier tour relativement gros, bien dilaté à l'extrémité à la manière du *Planorbis* (*Gyraulus*) *Crossei* Bourguignat, son ouverture ornée d'un bourrelet interne blanc très apparent⁵.

[b] POLYMORPHISME DE LA CARÈNE.

Typiquement la carène qui ceint le dernier tour de spire du *Planorbis* (*Tropidiscus*) *planorbis* Linné est absolument inférieure ;⁶ de plus, elle est presque toujours assez saillante. Cependant elle peut manquer à peu près entièrement (variété *ecarinatus* Westerlund⁷) et sa position varie considérablement.

Elle est parfois un peu moins inférieure et plus émoussée : c'est le cas du *Planorbis submarginatus* de Christophori et Jan.⁸

D'autre fois elle est à peu près basale ou subbasale, mais fortement obtuse, le profil du dernier tour étant bien arrondi en haut et subarrondi en bas (*Planorbis Philippii* de Monterosato).⁹

¹ WESTERLUND (C. A.), *Fauna palæarct. region Binnencoachyliën*, V, 1889, p. 69 (*Planorbis umbilicatus* forma 1) *major*.

² GERMAIN (LOUIS), *Etude Mollusques terr. fluvial. environs Angers et départ. Maine-et-Loire*, I, 1903, p. 191 (*Planorbis umbilicatus* β *pumilus*).

³ Cette variété *pumilus* vit dans les mares des landes du Perray, à Ecoiffant, près d'Angers (Maine-et-Loire).

⁴ GERMAIN (LOUIS), *loc. supra cit.*, I, 1903, p. 191, No. 181, pl. i, fig. 13 à 15.

⁵ Ce *Planorbe* vit aux environs d'Angers (Maine-et-Loire).

⁶ Chez le *Planorbis* (*Tropidiscus*) *carinatus* Müller la position de la carène est aussi variable ; moins fréquentes, ces variations sont pourtant aussi étendues puisque typiquement médiane, il se "rencontre des individus chez lesquels la carène est submarginale ou même tout à fait inférieure" [GERMAIN (LOUIS), *loc. supra cit.*, I, 1903, p. 194.] Le *Planorbis* (*Tropidiscus*) *pervius* BOURGUIGNAT [*Bulletin société malacologique France*, IV, 1886, p. 249] est une de ces formes : ici la carène est absolument basale ; de plus les tours de spire sont plus bombés et leur croissance est plus rapide.

⁷ WESTERLUND (C. A.), *Exposé critique Mollusques terr. eau douce Suède et Norvège*, Upsal, 1871, p. 125 (*Planorbis umbilicatus* δ *ecarinatus*). Cette variété a été figurée, peu exactement, par S. CLESSIN (in : MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, 1886, p. 76, taf. xiii, fig. 29 à 31).

⁸ CHRISTOPHORI (J. de) et JAN (G.), *Catalogus in IV sect. divis. . . . Prodrumus Faunae et Florae Italiae superioris*, II, 1832, XX, No. 9 et 12. Figuré par J. R. BOURGUIGNAT (*Malacologie terr. fluvial Algérie*, II, 1864, p. 15, pl. ix, fig. 20 à 22) sous le nom de *Planorbis complanatus* var. *B. submarginatus*.

⁹ MONTEROSATO (DE), in : CAZIOT (Commandant), *Mollusques vivants terr. et fluvial. Corse*, 1902, p. 262 (*Planorbis philippianus*) [= *Planorbis subangulatus* PHILIPPI, *Enumer. Mollusc. Siciliae*, II, 1844, p. 49, tab. xxi, fig. 6 (non *Planorbis*

Se rapprochant de la ligne médiane, la carène peut devenir inframédiane; dans ce cas elle reste saillante, comme chez la coquille nommée *Planorbis intermedius* de Charpentier,¹ ou s'atténue jusqu'à devenir presque nulle comme chez le *Planorbis salonensis* Florence.²

Enfin la carène est parfois tout à fait médiane: c'est le cas du *Planorbis dubius* Hartmann.³

J'ai, dans le tableau suivant, résumé et précisé les diverses modalités de la carène.

Carène basale		Carène subbasale		Carène inframédiane		Carène médiane	
saillante	obtuse	saillante	obtuse	saillante	obtuse	saillante	obtuse
<i>Pl. planorbis</i> L.	<i>Pl. Philippii</i> de Mont.	<i>Pl. submarginatus</i> de Chr. et Jan.	<i>Pl. Philippii</i> de Mont. (variété)	<i>Pl. intermedius</i> de Charp.	<i>Pl. salonensis</i> Fl.	<i>Pl. dubius</i> Hartm.	Forme inconnue.
↓						↓	
<i>Pl. gallicus</i> Bourg.						{ <i>Pl. carinatus</i> Müll. <i>Pl. pervius</i> Bourg.	

[γ] POLYMORPHISME DE LA SPIRE.

L'enroulement des tours de spire est typiquement *lent en dessus et en dessous* chez le *Planorbis (Tropidiscus) planorbis*; ⁴ de

subangulatus DE LAMARCK, 1807, *Annales Muséum Hist. Natur. Paris*, VIII, p. 151, No. 2, pl. lxii, fig. 1—2, espèce fossile; non: *Planorbis subangulatus* DESHAVES, *Descript. Coquilles fossiles environs de Paris*, II, Paris, 1824, p. 87, No. 8, pl. ix, fig. 14—15 qui est le *Planorbis depressus* NYST, *Coquilles fossiles Belgique*, 1848, p. 471, pl. xxxviii, fig. 19, espèce fossile) = *Planorbis Philippii* GERMAIN, *Etude Mollusques Henri Gadeau de Kerville Khroumirie*, 1908, p. 256]

¹ CHARPENTIER (DE), *Catalogue Mollusques terr. fluviat. Suisse; Denkschr. Schweiz. Gesellsch. Naturwiss. Neuchâtel*, I, 1837, p. 21, pl. ii, fig. 17 (des tirés à part) [= *Planorbis carinatus intermedius* WESTERLUND, *Malakozoolog. Blätter*, XXII, 1875, p. 104; et: *Fauna d. paläarkt. region Binnenconchylien*, V, 1889, p. 71; = *Planorbis carinatus* var. 4 *intermedius* CLESSIN, in: MARTINI et CHEMNITZ, *loc. supra cit.* XVII, 1886, p. 79].

² FLORENCE (F.), *Description Planorbe nouveau faune française, Bulletin Société Malacologique France*, VII, Juin 1890, p. 77.

³ HARTMANN (J. D. W.), *System. d. Erd- und Flussmollusken d. Schweiz*, in: *Neue Alpina*, I, 1821, p. 254 [= *Planorbis carinatus dubius* WESTERLUND, *Malakozoolog. Blätter*, XXII, 1875, p. 104; et: *loc. supra cit.*, V, 1889, p. 70; = *Planorbis marginatus* variété *fontinalis* HAZAY; = *Planorbis carinatus* var. 3 *dubius* CLESSIN, in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, 1886, p. 79; = ? *Helix planorbis crassa* SCHRÖTER, *Geschichte der Flussconchylien mit vorzüglicher Rücksicht auf diejenigen welche in Thüringischen Wasser leben*, Halae, 1779, p. 227, taf. v, fig. 14—15.]

⁴ Contrairement au *Planorbis (Tropidiscus) carinatus* Müller dont l'enroulement est plus rapide et dont les tours sont plus convexes.

plus, le dernier tour, médiocrement développé par rapport au pénultième, est un peu élargi, dilaté, à son extrémité. Cet enroulement peut être moins rapide encore avec un dernier tour à peine élargi (*Planorbis submarginatus* de Christophori et Jan, *Planorbis salonensis* Florence). Au contraire, la spire peut avoir un enroulement beaucoup plus rapide en dessus, avec un dernier tour mieux dilaté, tout en conservant, en dessous, un enroulement presque aussi lent que chez le type *Planorbis dubius* Hartmann.

[8] POLYMORPHISME DIFFUS.

Quelques mots seulement de la manière d'être du test. Il est généralement un peu solide, subopaque, d'une coloration variant du corné blond au brun sombre très intense ou au brun rongéâtre. Parfois plus mince, plus fragile, subtransparent, il rappelle assez souvent le test du *Planorbis (Tropidiscus) carinatus* Müller.

Les divers modes de polymorphisme qui viennent d'être passés en revue peuvent exister simultanément chez la même coquille.

On observe des Planorbes dont l'enroulement est, en dessus, notablement plus rapide que celui du type, normal en dessous et dont la carène est presque médiane. Ces coquilles correspondent au *Planorbis dubius* Hartmann.

D'autres fois, au mode basal ou subbasal de la carène—qui, de plus, est très émoussée—s'allie une mutation minor, la coquille ne dépassant pas 8 à 10 millimètres de diamètre maximum. Ce Planorbe correspond au *Planorbis Philippii* de Monterosato, si répandu dans toutes les régions circumméditerranéennes.

Il serait facile de multiplier les exemples. Ceux ci suffisent à montrer que tous les Planorbes dont il vient d'être question ne sauraient être considérés comme espèces distinctes. La plupart sont, simplement synonymes du *Planorbis (Tropidiscus) planorbis* Linné; les autres doivent lui être rattachées au titre de variétés.

Une mention spéciale doit être faite aux exemplaires de ce Planorbe provenant de l'Asie Centrale.

Les deux spécimens recueillis au Lankoran appartiennent à la variété *Philippii* de Monterosato, mais ils ont, au dernier tour, une carène subbasale très fortement émoussée, leur test est plus léger, d'un corné clair, presque entièrement recouvert d'un épiderme brun noirâtre; les stries longitudinales sont fines, subégales, serrées, très obliquement onduleuses en dessus comme en dessous. La taille atteint 7 millimètres de diamètre maximum. Cette coquille correspond à la forme décrite par F. ANCEY¹ sous le nom de *Planorbis persicus*²,³ et qui doit être considérée comme synonyme de la variété *Philippii* de Monterosato.

¹ ANCEY (F.), Description of new Species of Asiatic Shells, *The Nautilus*, XIV, No. 7, November 1900, p. 84.

² Ce Planorbe a été recueilli à Téhéran et à Salmas, au nord du lac d'Urmiah (Perse) par le Comm. G. NAEGELE.

³ "This is allied to, but different from *P. subangulatus* Phil., from which it is easily distinguished in being much less distinctly angled below the periphery." [F. ANCEY, *loc. supra cit.*, 1900, p. 84].

Les nombreux exemplaires provenant d'Asupás, au centre de la Perse, sont subconvexes en dessus, presque plats en dessous; leur dernier tour, assez grand et très légèrement dilaté à l'extrémité, montre une carène subbasale plus ou moins accentuée, parfois même très émoussée. L'ouverture est oblique et ovale transverse; ses bords marginaux sont convergents—le bord supérieur dépassant le bord columellaire—et réunis par une callosité blanche ou jaunâtre peu marquée. Le test, d'un corné brun assez clair, est opaque et garni, en dessus comme en dessous, de stries fines, obliques, irrégulières et serrées. Les plus grands individus mesurent 9 millimètres de diamètre maximum, 7 millimètres de diamètre minimum et $2\frac{1}{2}$ millimètres de hauteur.

En résumé, ce Planorbe appartient encore à la variété *Philippii* de Monterosato, mais il se rapproche de certaines formes du *Planorbis* (*Tropidiscus*) *planorbis* Linné variété *submarginatus* de Christophori et Jan. Il en est tout autrement de la coquille recueillie à Tangitar, dans la Kachgarie (Turkestan Oriental) par le DR. F. STOLICZKA qui constitue une variété très particulière dont voici les caractères.

Variété *tangitarensis* Germain.

Pl. IV, fig. 3, 4 et 8.

1878. *Planorbis* (*Anisus*) *subangulatus* (?) var. (? n. species) NEVILL, *Handlist Mollusca Indian Museum, Calcutta*, I, p. 243.
 1878. *Planorbis* (*Tropidiscus*) *subangulatus*, var., NEVILL, *Second Yarkand Mission, Mollusca, Calcutta*, p. 11.
 1918. *Planorbis* (*Tropidiscus*) *planorbis* variété *tangitarensis* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XXIV, No. 4, p. 276.

Coquille notablement plus comprimée, subconvexes en dessus, aplatie en dessous; spire composée de $5\frac{1}{2}$ —6 tours à enroulement plus lent, plus serré, le dernier proportionnellement moins grand, bien plus convexe en dessus qu'en dessous, *non caréné, mais fortement comprimé à la base* et devenant subanguleux près de l'ouverture; ouverture oblique, plus étroitement ovale transverse.

Diamètre maximum: 7 millimètres; diamètre minimum: 6 millimètres; hauteur; $1\frac{1}{2}$ millimètre.

Test plus léger, un peu brillant, corné clair, garni de stries fines, très serrées, bien obliquement onduleuses et inégales, plus fines et moins obliques en dessous qu'en dessus.

G. NEVILL a connu ce Planorbe dont il dit: "Four specimens only were found at North Tangitar; the form is very remarkable one, and may, I think, prove to be new, it is very different from Persian specimens of *P. subangulatus*, as also from European *P. marginatus*; the angulation is less distinct than in the former, the whole shell more compressed and flattened out, the spire showing distinctly all five whorls; the aperture is more contracted, and the under side less deeply sunk."¹

¹ NEVILL (G.), *Scientific Results of the Second Yarkand Mission, Mollusca, Calcutta*, 1878, p. 11.

Ces remarques sont exactes, bien que ce *Planorbis* ait, en réalité, au moins $5\frac{1}{2}$ tours de spire et que G. NEVILL lui donne jusqu'à 8 millimètres de diamètre maximum et $1\frac{1}{4}$ millimètre de hauteur, dimensions notablement plus grandes que celles des exemplaires que j'ai étudiés.

En résumé, la variété *tangitarenensis* Germain se distingue de la variété *Philippii* de Monterosato par sa forme générale bien plus comprimée, sa spire à tours plus nombreux et plus serrés avec un dernier tour moins anguleux, son ouverture plus étroite et son test plus délicat. Elle méritera peut être d'être élevée au rang spécifique quand elle aura été retrouvée dans d'autres localités.¹

Planorbis (Tropidiscus) marmoratus Michaud.

- 1830. *Planorbis marmoratus* MICHAUD, *Catal. Testac. viv. Alger*, p. 11 pl. i, fig. 28 à 30.
- 1839. *Planorbis marmoratus* TERVER, *Catal. Mollusques terr. fluvial Afrique*, p. 34.
- 1841. *Planorbis marmoratus* ROSSMÄSSLER, in : WAGNER. *Reisen in der Regentsch. Alger*, III, p. 250, No. 63.
- 1853. *Planorbis complanatus* var. *B. minor* MORELET, *Catalogue Mollusques Alger, Journal de Conchyliologie*, IV, p. 294.
- 1864. *Planorbis complanatus* var. *marmoratus* BOURGUIGNAT, *Malacologie Algérie*, II, Paris, p. 153, pl. ix, fig. 23 à 26.
- 1878. *Planorbis marmoratus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London [cité seulement à l'index alphabétique avec la mention : *marmoratus* Michaud, unidentified].
- 1885. *Planorbis marmoratus* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, cité à la p. 10 de la table alphabétique de la manière suivante : "Pl. *marmoratus* Mich. = *umbilicatus* var."
- 1887. *Planorbis marmoratus* LETOURNEUX et BOURGUIGNAT, *Prodrome Malacologie Tunisie*, Paris, p. 134.
- 1908. *Planorbis (Gyorbis) marmoratus* GERMAIN, *Etude Mollusques recueillis par HENRI GADEAU DE KERVILLE en Khroumirie*, Paris et Rouen, p. 259.

LOCALITÉ :

Algérie : Ruisseaux de la Maison Carrée, à Alger ; exemplaires de petite taille.

DISTRIBUTION GÉOGRAPHIQUE.

En Europe, le *Planorbis (Tropidiscus) marmoratus* Michaud n'est connu qu'en Espagne aux environs de Cadix, et en Portugal, près de Lisbonne [DR. G. SERVAIN].² En Afrique, en dehors de l'Algérie où il a été tout d'abord découvert [G. MICHAUD, TERVER, DR. M. WAGNER, A. MORELET, J. R. BOURGUIGNAT, etc.

¹ Deux exemplaires anormaux se trouvaient avec les spécimens de la variété *tangitarenensis* Germain. Ils ont un enroulement irrégulier—surtout aux premiers tours—with un dernier tour descendant à l'extrémité. Leur test montre une sculpture plus accentuée.

² SERVAIN (DR. G.). *Etude sur les Mollusques recueillis en Espagne et en Portugal*, Saint-Germain, Août 1880, p. 141.

....], il a été signalé en Tunisie [A. LETOURNEUX, HENRI GADEAU DE KERVILLE] et même en Egypte [DR. W. INNES¹].

Ce Planorbe n'est bien certainement qu'une forme représentative, principalement répandue dans l'Afrique du Nord, du *Planorbis* (*Tropidiscus*) *planorbis* Linné dont il se distingue seulement par son animal maculé de taches brunes, sa coquille ne comprenant que 4 tours de spire, sa coloration d'un corné grisâtre et sa taille plus faible ne dépassant pas 4 à 5 millimètres de diamètre maximum et 2 à 2½ millimètres de hauteur maximum.

Planorbis (*Tropidiscus*) *carinatus* Müller.

- 1774. *Planorbis carinatus* MÜLLER, *Verm. terrest. et fluviat. Histor.*, II, p. 157, No. 344.
- 1778. *Helix limbata* DA COSTA, *Testac. Britann.*, p. 63, pl. iv, fig. 10 et pl. viii, fig. 8 [non : *Helix limbata* Draparnaud, espèce terrestre].
- 1801. *Planorbis acutus* POIRET, *Coquilles Aisne, environs Paris, Prodrome*, p. 91.
- 1803. *Helix carinata* MONTAGU, *Testac. Britann.*, p. 450 et *Suppl.*, pl. xxv, fig. 1.
- 1803. *Helix complanata* MONTAGU, *Testac. Britann.*, p. 450 et *Suppl.*, pl. xxv, fig. 4 [non LINNÉ].
- 1820. *Planorbis umbilicatus* STUDER, *Kurz. Verzeichn. Conchylien*, p. 92 [non MÜLLER].
- 1835. *Planorbis carinatus* ROSSMÄSSLER, *Iconographie der Land-und Süßwasser-Mollusk.*, I, p. 102, taf. ii, fig. 60.
- 1851. *Planorbis carinatus* DUPUY, *Histoire Mollusques terr. et fluviat. France*, p. 444, pl. xxi, fig. 7.
- 1855. *Planorbis carinatus* MOQUIN-TANDON, *Histoire Mollusques terr. et fluviat. France*, II, p. 431, pl. xxx, fig. 29 à 33.
- 1875. *Planorbis carinatus* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 103, No. 4.
- 1878. *Planorbis carinatus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. ii, fig. 12.
- 1878. *Planorbis* (*Anisus*) *carinatus* NEVILL, *Handlist Mollusca Indian Museum, Calcutta*, I, p. 243, No. 23.
- 1882. *Planorbis carinatus* LOCARD, *Prodrome, Catalogue Mollusques terr. fluviat. France*, Lyon et Paris, p. 187.
- 1885. *Planorbis carinatus* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 70, No. 9.
- 1886. *Planorbis carinatus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 77, No. 49, taf. xiii, fig. 4 à 7 et 11 à 13.
- 1893. *Planorbis carinatus* LOCARD, *Coquilles fluviatiles France*, Lyon et Paris, p. 53, fig. 37.
- 1913. *Planorbis* (*Tropidiscus*) *carinatus* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 251, fig. 296 à 298.

LOCALITÉS :

Allemagne : Halle [Collect. G. NEVILL] ; No. 4102 ; = Potsdam [Collect. DR. E. von MARTENS].

Autriche : Sans localité précise [Collect. DR. F. STOLICZKA].

¹ INNES (DR. W.), Recensement des Planorbes et des Valvées de l'Egypte, *Bulletin Société Malacologique France*, I, 1884, p. 334.

France : Aix-en-Provence (Bouches-du-Rhône) ; un exemplaire.
Iles Britanniques : Irlande, sans localité précise.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe vit dans presque toute l'Europe, mais il est beaucoup plus rare vers le nord que dans les régions centrales. Il a cependant été signalé au Danemark [C. M. STEENBERG¹], en Suède [C. A. WESTERLUND²] et en Finlande [A. LUTHER³]. Au sud, il vit dans la péninsule ibérique où il est rare [A. LOCARD,⁴ A. MORELET,⁵ A. NOBRE⁶], dans presque toute l'Italie [G. B. ADAMI,⁷ C. POLLONERA,⁸ C. PORRO,⁹ C. A. STATUTI,¹⁰ etc. . . .], le Montenegro [OTTO WOHLBEREDT¹¹ et la Grèce [C. A. WESTERLUND et H. BLANC¹²]. Il s'avance en Asie-Mineure [R. STURANY¹³] où son aire de dispersion reste peu étendue.¹⁴ Enfin il manque complètement dans l'Afrique du nord où il est remplacé par des formes du *Planorbis (Tropidiscus) planorbis* Linné.

¹ STEENBERG (C. M.), Fures bœns Molluskenfauna, *Kgl. Danske Vidensk. Selsk. Skrifter Naturvidensk. og Mathem. Afd. 8, III*, Kjøbenhavn, 1917, p. 88, fig. 20—21.

² WESTERLUND (C. A.), *Exposé critique Mollusques terr. eau douce Suède et Norvège*, Upsal, 1871, p. 126.

³ LUTHER (A.), Bidrag till kännedom om Land- och Sötvattengastropodernas utbredning i Finland, *Acta Societatis pro Fauna et Flora Fennicae*, Helsingfors, XX, No. 3, 1901, p. 101.

⁴ LOCARD (A.), *Conchyliologie portugaise. Les coquilles terr. eaux douces et saumâtres*, *Archives Muséum Hist. natur. Lyon*, VII, 1899, p. 179.

⁵ MORELET (A.), *Description des Mollusques terr. et fluviat. du Portugal*, 1845, p. 79; et *Révision des Mollusques terr. et fluviat. du Portugal*, *Journal de Conchyliologie*, XXV, 1877, p. 260.

⁶ NOBRE (A.), *Catalogue Mollusques envir Coïmbre (Portugal). Mémoires Société royale malacologique Belgique*, Bruxelles, XX, 1885, p. 15, No. 46.

⁷ ADAMI (G. B.), *Molluschi terr. fluviat. . . n. valle dell' Oglio*, *Atti d. Societ. Veneto-Trentina*, V, 1876, p. 75.

⁸ POLLONERA (C.), *Elenco dei Molluschi fluviat. vivent. in Piemonte*, *Bollettino d. Musei Zoolog. Anat. compar. R. Univers. di Torino*, IV, No. 72, 15 Décembre 1889, p. 6, No. 20.

⁹ PORRO (C.), *Malacologia terrestre e fluviale della Provincia Comasca*, Milano, 1838, p. 80, No. 66 II.

¹⁰ STATUTI (C. A.), *Catalogo sistematico e sinonim. d. Molluschi terrestrie fluviat. viventi n. provincia Romano*; *Atti dell' Accademia pontifica de Nuovi Lincei*, XXXIV, Roma, 1882, p. 70, No. III.

¹¹ WOHLBEREDT (OTTO), *Zur Fauna Montenegro und Nordalbanien*, *Wissenschaftl. Mittheilung. aus Bosnien und Herzegowina*, Wien, XI, 1909, p. 104.

¹² WESTERLUND (C. A.), et BLANC (H.), *Aperçu faune malacologique Grèce, Epire et Thessalie*, Napoli, 1879, p. 126.

¹³ STURANY (R.), *Beitrag z. Kenntniss d. Kleinasiatischen Mollusken fauna*, *Sitzungsber. d. Kaiserl. Akad. d. Wissensch. Wien, Mathem.-Natur. Cl.*, CXI, Mars 1902, p. 137.

¹⁴ A. MOUSSON [Coquilles terrestres et fluviatiles recueillies par M. LOUIS GRAESER, dans le bassin de l'Amour, *Journal de Conchyliologie*, XXXV, 1887, p. 22, No. 22] a signalé cette espèce dans le bassin de l'Amour [Rivière Mülki, à Permskoe]; mais cette identification est douteuse. Il est fort probable qu'il s'agit d'une variété du *Planorbis (Tropidiscus) planorbis* Linné G. GERSTFELD [*Land- und Süßwasser-Mollusken Sibiriens und des Amurgebietes*, 1859, p. 12] et A. G. DE SCHRENCK [*Reisen und Forschungen in Amurlande*, Saint-Petersburg, 1860, p. 630] avaient déjà signalé, dans les mêmes régions, une coquille analogue. D'après A. MOUSSON, les exemplaires recueillis sont de petite taille (diamètre maximum: 7 millimètres), le test est plus solide que chez le *Planorbis carinatus* Müller et la carène du dernier tour est inframédiane, tous caractères qui correspondent mieux au *Planorbis planorbis* Linné qu'à l'espèce de O. F. MÜLLER.

Des exemplaires du Musée de Calcutta, les plus intéressants sont ceux provenant des environs de Halle et de Potsdam. Les premiers sont très typiques, mais de petite taille (diamètre maximum : 12—14 millimètres) ; les seconds sont de très grande taille, atteignant jusqu' à 17 millimètres de diamètre maximum et 14½ millimètres de diamètre minimum.

Sous-genre **Diplodiscus** Westerlund, 1897.

- 1880. *Tropidiscus* FISCHER et CROSSE, *Etudes Mollusques terr. fluviat. Mexique et Guatemala*, II, Paris, p. 68 [non : *Tropidiscus*, STEIN, 1850].
- 1885. *Gyrorbis* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 71, No. 4 (part ; = *Gyrorbis* + *Paraspira*).
- 1897. *Diplodiscus* WESTERLUND, *Acta Societatis pro Fauna et Flora Fennicae*, XIII, p. 115 [non : *Diplodiscus* DIESING, 1850].
- 1905. *Diplodiscus* DALL, *Land and Freshwater Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New-York, p. 85.

Coquille de petite taille, très déprimée ; spire formée de nombreux tours à croissance lente et régulière, le dernier médiocre (souvent à peine plus grand que l'avant dernier), fortement caréné à la périphérie ; ouverture obliquement ovulaire.

Type : *Planorbis vortex* Linné.

Les *Diplodiscus* vivent dans tout le système paléarctique ; ils habitent également les Antilles, l'Amérique Centrale et l'Amérique du Sud.

§ I.

Planorbis (Diplodiscus) vortex Linné.

- 1758. *Helix vortex* LINNÉ, *Systema Naturae*, Ed. X, p. 772.
- 1774. *Planorbis vortex* LINNÉ, *Vermium terr. et fluviatil. Histor.*, II, p. 158, No. 345.
- 1778. *Helix planorbis* DACOSTA, *Test. Britann.*, p. 65, pl. iv, fig. 12 [non : LINNÉ].
- 1805. *Planorbis vortex* DRAPARNAUD, *Histoire Mollusques France*, p. 44, pl. ii, fig. 4—5.
- 1820. *Planorbis tenellus* STUDER, *Kurz. Verzeichn. Conchyl.*, p. 92.
- 1835. *Planorbis vortex* ROSSMÄSSLER, *Iconogr. der Land-und Süsswasser-Mollusk.*, I, p. 104, pl. ii, fig. 61.
- 1851. *Planorbis vortex* DUPUY, *Histoire Mollusques terr. fluviat. France*, p. 442, pl. xxi, fig. 10.
- 1855. *Planorbis vortex* MOQUIN-TANDON, *Histoire Mollusques terr. fluviat. France*, II, p. 433, pl. xxx, fig. 34 à 37.
- 1875. *Planorbis vortex* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 104, No. 5, taf. iii, fig. 7 à 9.
- 1878. *Planorbis vortex* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. ii, fig. 13a—13b.
- 1878. *Planorbis (Anisus) vortex* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 243, No. 19.
- 1882. *Planorbis vortex* LOCARD, *Prodrome, Catalogue Mollusques terr. fluviat. France*, Lyon et Paris, p. 188.
- 1885. *Planorbis vortex* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 71, No. 10.
- 1886. *Planorbis vortex* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit.

XVII, Nürnberg, p. 82, No. 52, taf. xiv, fig. 21 à 23 et taf. xix,

fig. 12.

1893. *Planorbis vorticatus* LOCARD, *Coquilles fluviatiles France*, Lyon et Paris, p. 57, fig. 42—44.

1913. *Planorbis (Diplodiscus) vortex* GERMAIN, *Mollusques France et régions Voisines*, Paris, p. 254, fig. 299—300.

LOCALITÉS :

Allemagne : Potsdam [Envoi du Dr. E. von Martens].

Angleterre : Sans localité précise [coll. G. Nevill].

France : Environs d'Angoulême (Charente) — ? (sans localité).

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce vit dans toute l'Europe, y compris, au nord, la Suède, la Norvège [C. A. WESTERLUND ¹] la Finlande [A. E. NORDENSKIÖLD et A. E. NYLANDER ²; A. LUTHER ³] d'où elle passe en Sibérie [C. A. WESTERLUND ⁴]. Dans les régions méridionales de l'Europe elle est moins répandue : assez commune en Bulgarie [OTTO WOHLBEREDT ⁵], commune dans de nombreuses localités d'Italie, ⁶ elle est très rare dans la péninsule ibérique ⁷ et semble manquer complètement dans la Grèce et le Péloponèse. ⁸

Les exemplaires recueillis à Angoulême (Charente) sont de grande taille, puisqu'ils atteignent jusqu'à 14—15 millimètres de diamètre maximum alors que la très grande majorité des individus typiques ne dépassent pas 10 à 12 millimètres de diamètre maximum. Ils appartiennent donc à une forme major assez nette.

Ce Planorbe varie dans des proportions relativement étendues. Le dernier tour offre une carène tranchante qui, dans le type, est basale ou subbasale mais qui peut être médiane comme dans la variété *compressus* Michaud ⁹ qui est presque aussi répandue que la forme type.

¹ WESTERLUND (C. A.), *Exposé critique Mollusques terrestres eau douce Suède et Norvège*, Upsal, 1871, p. 127.

² NORDENSKIÖLD (A. E.) et NYLANDER (A. E.), *Finlands Mollusker*, Helsingfors, 1856, p. 62, No. 4.

³ LUTHER (A.), *Bidrag till Kannedomen Land-öch Sötvattengastropodernas utbredning i Finland*, *Acta Societatis pro Fauna et Flora Fennicae*, Helsingfors, XX, No. 3, 1901, p. 101.

⁴ WESTERLUND (C. A.), *Sibiriens Land-öch Sötvatten-Mollusker*, Stockholm, 1877, p. 587.

⁵ WOHLBEREDT (OTTO), *Zur Mollusken fauna von Bulgarien*, *Abhandlungen d. Naturforsch. Gesellschaft in Görlitz*, XXVII, 1911, p. 51.

⁶ Où il a été signalé par presque tous les auteurs de faunes locales.

⁷ A LOCARD [*Conchyliologie portugaise—Les coquilles terr. eaux douces et saumâtres*, *Archives Muséum Hist. natur. Lyon*, VII, 1899, p. 180] le dit très rare en Portugal.

⁸ Où il est remplacé par le *Planorbis spirorbis* Linné [*Helix spirorbis* LINNÉ, *Systema Naturae*, Ed. X, 1758, p. 770] qui s'avance jusqu'en Asie Mineure.

⁹ MICHAUD (G.), *Complément Histoire Mollusques* DRAPARNAUD, 1831, p. 81, pl. xvi, fig. 6—8 (*Planorbis compressus*).

Planorbis (Diplodiscus) vorticulus Troschel.

1834. *Planorbis vorticulus* TROSCHERL, *De Limnaeaceis Gasteropodis pulmonatis*, Berolini, p. 51.
1870. *Planorbis vorticulus* REINHARDT *Nachrichtsblatt d. deutschen Malakozool. Gesellschaft*, p. 21 à 25.
1875. *Planorbis vorticulus* WESTERLUND, *Malakozöolog. Blätter*, XXII, 1875, p. 75 et p. 106, No. 6, taf. iii, fig. 22 à 24.
1881. *Planorbis (Tropidiscus) vorticulus* WESTERLUND, *Ofversigt af Kongl. Vetenskaps-Akadem. Forhandlingar*, Stockholm, No. 4, p. 46, No. 30.
1884. *Gyrorbis vorticulus* CLESSIN, *Deutsche Excursions-Mollusken Fauna*, II, p. 414, fig. 275.
1885. *Planorbis vorticulus* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 72, No. 11.
1886. *Planorbis vorticulus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 104, No. 68, taf. xix, fig. 26 à 28.
1886. *Gyrorbis vorticulus* REINHARDT, *Verzeichnis d. Weichthiere der Provinz Brandenburg*, Berlin, p. 15.
1888. *Planorbis vorticulus* BORCHERDING, *Abhandlungen des Naturwissensch. Vereins zu Bremen*, X, p. 6, taf. iv, fig. 1, 1a, 1b, 1c, fig. 2, 2a.

LOCALITÉ :

Pologne : Gouvernement de Kalisch. [=Kaliz], sans localité précise ; vingt exemplaires appartenant à la variété *charteus* Held.

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis (Diplodiscus) vorticulus* Troschel habite l'Allemagne et la Suède ; la variété *charteus* Held s'étend davantage vers le sud ; non seulement elle est connue en Allemagne, en Hollande, en Antriche, en Pologne et en Russie [S. CLESSIN, C. A. WESTERLUND], mais CARLO POLLONERA l'a retrouvée, en Lombardie, dans la vallée du Pô.¹

Les exemplaires du Musée d'Histoire naturelle de Calcutta appartiennent tous à la variété *charteus* Held² et présentent les caractères suivants :

Coquille très déprimée, légèrement subconvexe en dessus, presque plane ou avec une concavité très peu marquée en dessous ; spire composée de 5—6 tours un peu plus convexes dessus que dessous, à croissance lente et très régulière ; dernier tour médiocrement développé, légèrement plus convexe en dessus qu'en dessous, un peu descendant à l'extrémité, muni d'une carène

¹ POLLONERA (CARLO), *Elenco dei Molluschi fluviali viventi in Piemonte, Bollettino Musei Zoologia Anatom. Compar. R. Univ. de Torino*, IV, No. 72, 15 Décembre 1889, p. 6, No. 22 (sous le nom de *Planorbis acies*).

² HELD (F.), *Isis*, 1837, p. 305 (*Planorbis charteus*) [= *Planorbis acies* MEGERLE VON MUELFELDT, in : ROSSMÄSSLER, *Iconographie der Land- und Süßwasser-Mollusken*, XVIII, 1859, p. 134, fig. 966 et : G. B. SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, 1878, pl. xii, fig. 102a—102b ; = *Planorbis vorticulus* β *charteus* WESTERLUND, *Malakozöolog. Blätter*, XXII, 1875, p. 105, taf. iii, fig. 25 à 27 ; = *Planorbis vorticulus* var. 1. *charteus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *System. Conchylien-Cabinet*, XVII, 1886, p. 105 ; = *Planorbis charteus* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, 1889, p. 72].

subobtuse et à peine inframédiane¹ : sutures bien marquées, sub-profondes; ouverture fortement oblique, ovulaire transverse, anguleuse à la base, à bords marginaux rapprochés et très convergents réunis par une callosité blanchâtre relativement développée.

Diamètre maximum : 5—7 millimètres ; diamètre minimum : 4—6 millimètres ; hauteur maximum : $\frac{1}{2}$ — $\frac{3}{4}$ millimètres.

Test mince, léger, translucide, d'un corné jaunâtre peu brillant, orné de stries longitudinales obliquement incurvées, très serrées et extrêmement fines et délicates.

§ II.

Planorbis (Diplodiscus) cultratus d'Orbigny.

1853. *Planorbis cultratus* D'ORBIGNY, in : RAMON DE LA SAGRA, *Histoire phys. polit. et natur. île de Cuba*, p. 196, pl. xiv, fig. 5 à 8.
1861. *Planorbis Duenasianus* TRISTRAM, *Proceedings Zoological Society of London*, p. 232.
1870. *Planorbis kermatoides* R. TATE, *American Journal of Conchology*, V, p. 158 [non : *Planorbis kermatoides* D'ORBIGNY].
1873. *Planorbis* nov. sp. STREBEL, *Beitrag zur Kenntniss der Fauna Mexican.* p. 46, taf. v, fig. 24.
1878. *Planorbis cultratus* SOWERBY, *Monograph of the Genus Planorbis*, in : L. REEVE *Conchologia Iconica*, XX, London, pl. xiii, fig. 106.
1883. *Planorbis cultratus* MAZÉ, *Journal de Conchyliologie*, XXI, p. 27, No. 46.
1884. *Planorbis cultratus* FISCHER et CROSSE, *Etudes Mollusques terr. et fluviat. Mexique et Guatemala*, II, Paris, p. 68, No. 8, pl. xxxii, fig. 7—7c.
1886. *Planorbis cultratus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 148, No. 127, taf. xxii, fig. 3.
1889. *Planorbis cultratus* PILSBRY, *The Nautilus*, III, p. 63, pl. i, fig. 1—3.
1899. *Planorbis (Spiralina) cultratus* MARTENS, *Land und Freshwater Mollusca*, (*Biologia Centrali-Americana*, London), p. 395, No. 17.
1907. *Planorbis cultratus* HINCKLEY, *The Nautilus*, XXI, No. 7, p. 18.
1918. *Planorbis cultratus* BRYANT WALKER, *Synopsis . . . Freshwater Mollusca North America; etc. . . University of Michigan, Miscellaneous Publications No. 6, Michigan*, p. 98.
1918. *Planorbis cultratus* LUTZ, *Memorias do Instituto Oswaldo Cruz*, Rio de Janeiro, X, fasc. I, p. 75, No. 10, est. XVIII, fig. 10a—10d.

¹ La position de la carène est, d'ailleurs, assez variable : presque basale dans quelques exemplaires, elle remonte insensiblement vers le milieu du dernier tour et certains spécimens possèdent une carène à peu près médiane, tous les intermédiaires existant entre ces deux manières d'être. La coquille à carène submédiane correspond très sensiblement à la forme nommée variété *bavaricus* par C. A. WESTERLUND [*Malakozoolog. Blätter* XXII, 1875, p. 106, taf. iii, fig. 28 à 30 (*Planorbis vorticulus* ? *bavaricus*) ; et : *Fauna der palaearct. region Binnenconchylien*, V, 1889, S. CLESSIN (in : MARTINI et CHEMNITZ *loc. supra cit.*, XVII, 1886, p. 107) considère, je crois avec raison, la variété *bavaricus* Westerlund comme synonyme de la variété *charteus* Held.

LOCALITÉS :

Antilles : Guadeloupe; 3 exemplaires.

Venezuela : Sans indication précise de localité; un exemplaire.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce habite les Antilles : Cuba (?) [DE CANDÉ], la Guadeloupe [A. BAVAY, BEAU, CAYROL, E. MARIE, H. MAZÉ, SCHRAMM, etc. . . .], la Martinique [DE CANDÉ] : = le Mexique [H. CROSSE, A. A. HINCKLEY, H. STREBEL, etc. . . .]; = le Guatemala [O. SALVIN]; = le Nicaragua [R. TATE], et, d'après le Dr. E. von MARTENS, le Venezuela et le Brésil. Dans ce dernier pays, les Dr. A. LUTZ et PENNA l'ont recueillie en de nombreuses localités, notamment dans l'état de Pernambuco [Cf. A. LUTZ, *loc. supra cit.*, p. 75 (et p. 55 de la traduction anglaise)].

Vers le nord, le *Planorbis* (*Diplodiscus*) *cultratus* d'Orbigny a été trouvé, mais très rarement, en Floride [S. N. RHOADS¹] et au Texas [SINGLEY, in : H. A. PILSBRY et J. H. FERRISS²].

Les exemplaires de l'Amérique du sud atteignent une taille plus grande que ceux des Antilles et de l'Amérique Centrale. Alors que les individus de ces deux dernières régions ont de 4½ à 5 millimètres de diamètre maximum et 1 millimètre de hauteur,³ ceux du Venezuela—appartenant au Musée d'Histoire naturelle de Calcutta—mesurent 8½ millimètres de diamètre maximum et ceux recueillis au Brésil⁴ ont, d'après le Dr. E. von MARTENS, jusqu'à 9 millimètres de diamètre maximum.

Planorbis (*Diplodiscus*) *kermatoides* d'Orbigny.

- 1835. *Planorbis kermatoides* D'ORBIGNY, *Synopsis terr. et fluvialit. . . . Molluscorum American meridion.*, p. 27, No. 7.
- 1837. *Planorbis kermatoides* BECK, *Index Molluscorum*, p. 122.
- 1843. *Planorbis kermatoides* D'ORBIGNY, *Voyage Amérique méridionale*, V, 3^e partie, *Mollusques*, Paris, p. 349, pl. xlv, fig. 1 à 4.
- 1856. *Planorbis kermatoides* DUNKER, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 62, No. 34, taf. x, fig. 1 à 3.
- 1878. *Planorbis* (*Anisus*) *kermatoides* NEVILL, *Handlist Mollusca Indian Museum, Calcutta*, I, p. 343, No. 20.

LOCALITÉ :

Pérou : Sans indication de localité [Collect. A. MORELET]; 6 exemplaires.

¹ "Very rare. One specimen secured from a drainage ditch flowing into the Miami River two miles above its mouth . . . This is the first record of it from Florida" S. N. RHOADS, *Annotated list of Land and Fresh-water Shells recently collected in the vicinity of Miami, Florida*, *The Nautilus*, XXIII, No. 4, Août 1899, p. 48.

² PILSBRY (H. A.) et FERRISS (J. H.), *Mollusca of the Southwestern States*, II, *Proceedings Academy Natural Sciences of Philadelphia*, LVIII, 1906, p. 165.

³ La hauteur est de 1 millimètre.

⁴ Notamment à Ceara, dans la région nord du Brésil [DR E. von MARTENS, *Die Binnenmollusken's Venezuela*, *Festschrift. . . . Gesellsch. Naturforsch. Freunde Berlin*, 1873, p. 197].

DISTRIBUTION GÉOGRAPHIQUE.

Le Pérou, notamment dans la région de Lima [G. DUNKER, A. D'ORBIGNY, etc. . . .].

Le *Planorbis kermatoides* d'Orbigny est surtout voisin du *Planorbis cultratus* d'Orbigny, mais il s'en sépare : par sa taille plus grande (13 millimètres de diamètre maximum au lieu de 9 millimètres comme chez le *Planorbis cultratus* d'Orbigny) ; par sa face supérieure bien plus ombiliquée ; par ses tours de spire plus nombreux et par sa carène plus fortement accentuée.¹

§ III.

Planorbis (Diplodiscus) hyptiocyclus Benson.

Pl. II, fig. 1—2—3.

- 1863. *Helix hyptiocyclus* BENSON, *Annals and Magazine of Natural History*, London, Ser. 3, II, p. 89.
- 1868. *Helix hyptiocyclus* PFEIFFER, *Monograph Heliceor. vivent.*, V, Lipsiae, p. 177, No. 948.
- 1876. *Planorbis hyptiocyclus* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 40, pl. xcix, fig. 5—6 et 7.
- 1878. *Planorbis hyptiocyclus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. xiv, fig. 120a—120b.
- 1878. *Planorbis (Nautilina) hyptiocyclus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 245, No. 36.
- 1886. *Planorbis hyptiocyclus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 228, No. 254.
- 1915. *Planorbis* (?) *Gyraulus* *hyptiocyclus* PRESTON, *Fauna of British India : Mollusca [Freshwater Gasteropoda and Pelecypoda]* London, p. 123, No. 248.

LOCALITÉS :

Ile de Ceylon : Fort Mac Donald ; deux exemplaires ; = Balapiti [Collect. G. NEVILL].

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe est uniquement connu de l'Ile de Ceylon, notamment de la province d'Uva [F. LAYARD (in : W. H. BENSON, *loc. supra cit.*, 1863, p. 89) ;—S. HANLEY et W. THEOBALD, *loc. supra cit.*, 1876, p. 60 ;—G. NEVILL, *loc. supra cit.*, 1878, p. 245)].

¹ Voici, à titre de comparaison, les diagnoses originales des deux espèces :

Planorbis kermatoides D'ORBIGNY, *loc. supra cit.*, 1835, p. 27, No. 7 :

"Testa discoidea, depressissima, tenui, striata, cornea ; superne plano-convexa, subtus plano-concava, ad peripheriam carinata ; septem anfractibus ; sutura plana ; apertura angulata, obliqua.—Alt. 1½ mill., ampl. 13 mill.—Habit. provincia Limacensis (Republika Peruviana)."

Planorbis cultratus D'ORBIGNY, *loc. supra cit.*, 1835, p. 196 :

"Pl. testa discoidea, depressissima, tenui, diaphana, laevigata, succinea, superne concava, subtus complanata, ad peripheriam carinato cultrata, marginata ; anfractibus sex angulatis, supra convexis, subtus complanatis, apertura triangulari depressa.

"Diam. 9 mill., haut. : 1 mill."

Coquille très déprimée, à peine subconvexe en dessus, aplatie en dessous ; spire composée de 5 tours convexes à croissance lente et régulière séparés par des sutures bien marquées, un peu plus profondes en dessus qu'en dessous ; dernier tour médiocre, très légèrement dilaté à l'extrémité, aussi convexe en dessus qu'en dessous, muni d'une carène médiane peu aiguë mais très sensible ; ouverture oblique, ovulaire-transverse, avec une angulosité externe au point où aboutit la carène du dernier tour, à bords rapprochés bien convergents réunis par une forte callosité blanche, le bord supérieur dépassant le bord columellaire.

Diamètre maximum : 5—5½ millimètres ; diamètre minimum : 4¼—4½ millimètres ; hauteur maximum : ⅙—⅓ millimètre ; hauteur de l'ouverture : ⅓ millimètre ; diamètre de l'ouverture : 2 millimètres.

Test assez mince, subtransparent, d'un corné plus ou moins clair ; stries longitudinales très fines, serrées, un peu obliques et onduleuses, assez inégales, à peu près aussi accentuées en dessous qu'en dessus.

La description précédente et la figuration qui l'accompagne (Pl. II, fig. 1, 2, 3) ont été faites d'après les exemplaires très typiques appartenant au Musée d'Histoire naturelle de Calcutta.¹ On voit que ce Planorbe n'appartient pas au sous-genre *Gyraulus* : il ressemble beaucoup, en effet, au *Planorbis vortex* Linné de l'Europe et, comme ce dernier, il doit être classé dans le sous-genre *Diplodiscus*.

Sous-genre **Paraspira** Dall, 1905.

- 1840. *Spirorbis* SWAINSON, *A Treatise on Malacology* ; etc . . . , London, p. 337 [non : *Spirorbis* DAUDIN, 1800].
- 1864. *Gyrorbis* MÖRCH, *Vidensk. Meddel. Kjöb. för 1863*, p. 313 [non : FITZINGER, 1833].
- 1885. *Gyrorbis* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, p. 71, No. 4 [= *Gyrorbis* + *Paraspira*].
- 1886. *Gyrorbis* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 34, No. 9 (type : *Planorbis rotundatus* Poirét).
- 1905. *Paraspira* DALL, *Land and Freshwater Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New-York, p. 82 et p. 86.

Coquille de petite taille, très déprimée ; spire formée de nombreux tours à croissance lente et régulière, le dernier médiocre,

¹ La description ci-dessus diffère seulement par quelques détails de celle donnée par W. H. BENSON (*loc. supra cit.*, 1863, p. 89) :

"Testa latissima umbilicata, orbiculato-planata, planorbiformi, depressa, fragili, oblique striatula, translucens, polita, olivaceo-cornea ; spira concaviscula, apice foveolato, suturis profundis ; anfract. 4½, gradatim incrementibus, utrinque convexis, ultimo convexiusculo, peripheria subcarinata, apertura valde obliqua, elliptico-lunata ; peristomate tenui, acuto, marginibus conniventibus, callo tenui junctis.

"Alt. 1, 5, diam. major. 6, diam. min. 5 min."

Par contre, la description donnée par A. B. SOWERBY (*in* : L. REEVE, *loc. supra cit.*, 1878, sp. 120) est loin d'être exacte. Il dit, notamment : "... anfractibus tribus, latiusculis, supra suturam tumide elevatis..." ce qui est manifestement erroné et en contradiction absolue aussi bien avec la diagnose originale de W. H. BENSON reproduite ci-dessus qu'avec la propre figuration donnée par A. B. SOWERBY [*in* : L. REEVE, pl. xiv, fig. 120a] qui représente un Planorbe possédant un peu plus de 4 tours de spire.

non caréné mais bien arrondi ; ouverture arrondie, souvent bordée intérieurement.

Type : *Planorbis rotundatus* Poiret.

Les *Paraspira* habitent les eaux douces du système paléarctique.

Planorbis (Paraspira) rotundatus Poiret.

- 1801. *Planorbis rotundatus* POIRET, *Coquilles Aisne, environs de Paris, Prodrôme*, p. 93 [non : *Planorbis rotundatus* BRONGNIART].
- 1805. *Planorbis vortex* variété β DRAPARNAUD, *Histoire Mollusques terr. et fluviat. France*, p. 45, pl. ii, fig. 7—8.
- 1813. *Planorbis leucostoma* MILLET, *Mollusques Maine-et-Loire, Angers*, p. 16, No. 7.
- 1830. *Planorbis leucostoma* MICHAUD, *Complément Draparnaud*, p. 80, pl. xvi, fig. 3—5.
- 1851. *Planorbis leucostoma* DUPUY, *Histoire Mollusques terr. fluviat. France*, II, p. 435, pl. xxx, fig. 38 à 46.
- 1875. *Planorbis rotundatus* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 108, No. 10, taf. iii, fig. 40 à 42.
- 1882. *Planorbis rotundatus* LOCARD, *Prodrôme, Catalogue Mollusques terr. fluviat. France*, p. 189.
- 1885. *Planorbis leucostoma* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 73.
- 1886. *Planorbis rotundatus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., Nürnberg, XVII, p. 92, No. 60, taf. xiii, fig. 14 à 16 et taf. xiv, fig. 5 à 8, 13 à 16 et 28 à 31.
- 1893. *Planorbis rotundatus* LOCARD, *Coquilles terr. et fluviat. France, Lyon et Paris*, p. 57, fig. 45 à 47.
- 1913. *Planorbis (Paraspira) rotundatus* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 225, fig. 301.

LOCALITÉS :

Allemagne : Creuzburg (Silésie) ; exemplaires se rapportant à la variété *gracilis* Gredler.

Espagne : Environs de Burgos ; No. 104 B.

France : Aix-en-Provence (Bouches-du-Rhône) ; un exemplaire ; = Angoulême (Charente) ; No. 104 B ; = Dax (Landes) ; No. 104 B ; = Saint-Vallier.

DISTRIBUTION GÉOGRAPHIQUE.

Ce *Planorbe* habite toute l'Europe, y compris, au nord l'Islande [O. A. L. MÖRCH,¹ H. SCHLESCH²], la Suède et la Norvège [C. A. WESTERLUND] ;³ au sud, l'Espagne [Dr. G. Servain⁴] et l

¹ MÖRCH (O. A. L.), *Faunula Molluscorum Islandiae* (Oversigt over Islands Bløddyr), *Vidensk. Medd. fra den Naturhist. Forening i København*, Nos. 11-13, 1868, p. 201, No. 17.

² SCHLESCH (H.), Notes on *Planorbis* and *Margaritana* in Iceland, *The Naturalist*, Juin 1917, p. 201.

³ WESTERLUND (C. A.), *Exposé critique Mollusques terr. eau douce Suède et Norvège*, Upsal, 1871, p. 201.

⁴ SERVAIN (Dr. J.), *Étude sur les Mollusques recueillis en Espagne et en Portugal*, Saint-Germain, Août 1880, p. 142.

Portugal [A. MORELET,¹ A. NOBRE,² A. LOCARD³]. Il vit également en Sibérie [C. A. WESTERLUND⁴], se retrouve en Algérie [J. R. BOURGUIGNAT⁵], mais n'a jamais été signalé ni au Maroc, ni en Tunisie.

La variété *gracilis* Gredler⁶ se distingue du type *rotundatus* par ses tours de spire ordinairement plus nombreux—il y en a parfois jusqu'à 7, ce qui rappelle le *Planorbis (Paraspira) septemgyratus* Zeigler⁷—mais surtout par son dernier tour arrondi présentant une angulosité obsolète à la base. La taille de la variété *gracilis* Gredler varie de 5 à 6 millimètres de diamètre maximum et atteint, beaucoup plus rarement, 7 à 7½ millimètres de diamètre maximum. La répartition géographique de cette variété est beaucoup plus restreinte que celle du type ; on la trouve surtout dans l'Europe centrale

Planorbis (Paraspira) Villai Adami.⁸

1896. *Planorbis Villae* ADAMI, Molluschi terrestri e fluviatili ... d. Brescia e Bergamo, *Atti d. Soc. Veneto-Trentina*, V, p. 76, Noi 108, tav. i, fig. 14 à 16.
 1885. *Planorbis villae* WESTERLUND, *Fauna der palaearct. region Binnenconchylien*, V, p. 73.
 1886. *Planorbis Villae* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 22, No. 248.

LOCALITÉ :

Italie : Col d'Aprica, en Lombardie (cotype de l'auteur).

DISTRIBUTION GÉOGRAPHIQUE.

Ce *Planorbe* n'a encore été signalé qu'en Lombardie.

Le *Planorbis (Paraspira) Villai Adami* n'est qu'une variété locale du *Planorbis (Paraspira) rotundatus* Poirét se distinguant

¹ MORELET (A.), *Description des Mollusques terrestres et fluviatiles du Portugal*, Paris, 1845, p. 80.

² NOBRE (A.), *Catalogue des Mollusques des environs de Coimbre (Portugal), Mémoires Société Royale Malacologique Belgique*, XX, 1885, Bruxelles, 1886, p. 15, No. 47. (du tiré à part). Cette espèce est signalée, par A. NOBRE, sous le nom de *Planorbis leucostoma* Müller (err. typogr. p. MILLET).

³ LOCARD (A.), *Conchyliologie portugaise. Les Coquilles terrestres, des eaux douces et saumâtres*, *Archives Muséum hist. natur. Lyon*, VII, 1899, p. 180.

⁴ WESTERLUND (C. A.), *Sibériens Land-och Sötvatten-Mollusker*, Stockholm, 1877, p. 108.

⁵ BOURGUIGNAT (J. R.), *Malacologie terr. fluv. Algérie*, II, Paris, 1864, p. 155.

⁶ GREGLER *Tirols Land-und Süßwasser-Mollusk.*, 1859, II, p. 8 (*Planorbis rotundatus* variété *gracilis*) [= *Planorbis rotundatus* β *gracilis* WESTERLUND, *Malakozoolog. Blätter*, XXII, 1875, p. 109, taf. iii, fig. 43 à 45 ; = *Planorbis rotundatus* var. I. *gracilis* CLESSIN, *Deutsch. Excursions-Mollusken-Fauna*, 1877, 407, fig. 261, et, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1886, p. 93].

⁷ ZEIGLER in : ROSSMÄSSLER, *Iconographie der Land-und Süßwasser-Mollusken*, I, 1835, p. 106, fig. 64 ; = WESTERLUND, *Malakozoolog. Blätter*, XXII, 1875 p., 107, taf. iii, fig. 31 à 33 ; = CLESSIN, *loc. supra cit.*, 1877, p. 409, fig. 264. et in : MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, 1886, p. 86, taf. xiv, fig. 13 à 16 et 24 à 27.

⁸ Cette espèce est dédiée au naturaliste italien G. B. VILLA.

de cette dernière par sa taille plus petite,¹ sa spire formée seulement de $4\frac{1}{2}$ —5 tours au lieu de 6 ou $6\frac{1}{2}$ et son ouverture mieux arrondie.²

Les exemplaires du Musée d' Histoire naturelle de Calcutta sont intéressants par leur provenance, car ils ont été recueillis dans la localité originale où G. B. ADAMI a découvert son espèce, le col d'Aprica, près de l'auberge de la Poste, à l'altitude de 1235 mètres au dessus du niveau de la mer.

Planorbis (Paraspira) spirorbis Linné.

1758. *Helix spirorbis* LINNÉ, *Systema naturae*, Ed. X, I, p. 770.
 1774. *Planorbis spirorbis* MÜLLER, *Vermium terrest. et fluviat. histor.*, II, p. 161.
 1805. *Planorbis spirorbis* DRAPARNAUD, *Histoire Mollusques France*, p. 45, pl. ii, fig. 8—9.
 1835. *Planorbis spirorbis* ROSSMÄSSLER, *Iconographie der Land-und Süßwasser-Mollusken*, I, p. 106, taf. ii, fig. 63.
 1851. *Planorbis spirorbis* DUPUY, *Histoire Mollusques terr. et fluviat. France*, p. 438, pl. xxi, fig. 9.
 1853. *Planorbis vortex* MORELET, *Journal de Conchyliologie*, IV, p. 294 [non LINNÉ, n. auct. gall.].
 1855. *Planorbis spirorbis* MOQUIN-TANDON, *Histoire Mollusques terr. fluvi. France*, II, Paris, p. 437, pl. xxxi, fig. 1 à 5.
 1875. *Planorbis (Tropidiscus) spirorbis* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 108, No. 9, taf. iii, fig. 34 à 36.
 1878. *Planorbis (Bathyomphalus) spirorbis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 247, No. 54.
 1878. *Planorbis spirorbis* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, London, XX, pl. ii, fig. 14a—14b.
 1882. *Planorbis spirorbis* LOCARD, *Prodrome, Catalogue Mollusques terr. fluvi. France*, Lyon et Paris, p. 190.
 1885. *Planorbis (Gyrorbis) spirorbis* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, p. 73, No. 14.
 1886. *Planorbis spirorbis* CLESSIN, *Die Familie der Limnaeiden*, in MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII. Nürnberg, p. 91, No. 59, taf. xiii, fig. 8—10 et taf. xiv, fig. 1 à 4.
 1893. *Planorbis spirorbis* LOCARD, *Coquilles fluviatiles France*, Lyon et Paris, p. 58.
 1913. *Planorbis (Paraspira) spirorbis* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 225, fig. 202 et 309.

LOCALITÉS :

Allemagne : Sans localité précise [G. NEVILL].

Angleterre : Sans localité précise [G. NEVILL].

DISTRIBUTION GÉOGRAPHIQUE.

Souvent confondu avec le jeune du *Planorbis (Paraspira) rotundatus* Poiret, le *Planorbis (Paraspira) spirorbis* Linné habite toute l'Europe, s'avancant, en Finlande, jusqu' à 65° de lati-

¹ Diamètre maximum : 3 à $4\frac{1}{2}$ millimètres ; hauteur maximum : 1 millimètre.

² Dans sa diagnose, G. B. ADAMI définit ainsi l'ouverture et le péristome : "... *apertura perobliqua, ovali-rotundata, peristoma interdum leviter subalbolabium, marginibus disjunctis, vel lamina tenuissima conjunctis.*"

tude nord [A. LUTHER¹]. Il vit également en Islande [H. SCHLESCH²]. En Asie, il a été signalé en divers points de l'Asie Mineure [R. STURANY³]. Enfin, dans le nord de l'Afrique, de nombreux auteurs l'ont indiqué en Algérie [J. R. BOURGUIGNAT, BRONDEL, T. LETOURNEUX, A. MORELET, REYMOND, etc. .]; i semble beaucoup plus rare au Maroc [P. PALLARY⁴] et en Tunisie où il a été découvert par HENRI GADEAU DE KERVILLE [L. GERMAIN⁵].

Le *Planorbis* (*Paraspira*) *spirorbis* Linné se distingue des formes jeunes du *Planorbis* (*Paraspira*) *rotundatus* Poiret : par sa taille plus faible ; ses tours de spire moins nombreux et dont le dernier est bien moins dilaté à l'extrémité ; par son test plus mince et par son ouverture dépourvue de bourrelet intérieur.

Sous-genre *Tropicorbis* Brown et Pilsbry, 1914.

1880. *Gyrorbis* FISCHER et CROSSE, *Etude Mollusques terrestres et fluviatiles Mexique et Guatemala*, Paris, II, p. 70 [non : *Gyrorbis* FITZINGER, 1833].

1914. *Tropicorbis* BROWN et PILSBRY, *Proceedings Academy Natural Sciences of Philadelphia*, p. 212 (sans diagnose) [type : *Planorbis Liebmanni* Dunker].

Coquille de taille médiocre, déprimée mais non très aplatie spire formée de nombreux tours à croissance lente et régulière, le dernier médiocre, mais sensiblement plus grand que l'avant dernier, bien arrondi ; ouverture subarrondie, sans bourrelet interne.

Type : *Planorbis maya* Morelet.

Le sous-genre *Tropicorbis* a été créé par A. B. BROWN et H. A. PILSBRY en prenant pour type le *Planorbis Liebmanni* Dunker. Les auteurs n'ont donné aucune diagnose. J'adopte ce sous-genre pour une série de Planorbes très voisins les uns des autres, comme les *Planorbis orbiculus* Morelet, *Planorbis Liebmanni* Dunker, *Planorbis maya* Morelet, *Planorbis rectus* Morelet, *Planorbis petenensis* Morelet, *Planorbis aeruginosus* Morelet, etc. . . , qui vivent dans les Antilles et l'Amérique centrale où ils représentent les *Paraspira* de l'Europe. Ils se distinguent de ces derniers par leur coquille de forme moins déprimée, leur spire à tours moins nombreux et à enroulement plus rapide et leur ouverture sans bourrelet interne.

¹ LUTHER (A.), Bidrag till Kännedomen om Land-och Sötvattengastropodernas utbredning i Finland, *Acta Societatis pro Fauna et Flora Fennicae*, XX, No. 3, Helsingfors, 1901, p. 103.

² SCHLESCH (HANS), Notes on Planorbis and Margaritana in Iceland, *Hull Museum Publications* No. 112, Hull, Août 1917, p. 204.

³ STURANY (DR. R.), Beitrag z. Kenntniss d. Kleinasiatischen Mollusken fauna, *Sitzungsber. d. Kaiserl. Akad. d. Wissenschaftl. Wien*, CXI, Mars 1902, p. 137.

⁴ PALLARY (P.), Quatrième Contribution faune malacologique N. O. Afrique, *Journal de Conchyliologie*, LII, 1904, p. 33 et p. 54.

⁵ GERMAIN (LOUIS), *Etudes sur les Mollusques terr. fluviat. recueillis par HENRI GADEAU DE KERVILLE en Khroumirie*, Paris, 1908, p. 262 (Extrait de : HENRI GADEAU DE KERVILLE, *Voyage zoologique en Khroumirie*, Paris et Rouen, 1908).

Planorbis (Tropicorbis) orbiculus Morelet.

1849. *Planorbis orbiculus* MORELET, *Testacea noviss. insulae Cubanae et Amer. centr.* part I, No. 37.
1856. *Planorbis Haldemani* DUNKER, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed., XVII, Nürnberg, p. 59, No. 29, taf. x, fig. 38 à 40 [non : *Planorbis Haldemani* C. B. ADAMS].
1865. *Planorbis haldemani* BINNEY, *Land and Fresh Water Shells of North America*, II, p. 110, fig. 185.
1865. *Planorbis Haldemani* MARTENS, *Malakozoolog. Blätter*, XII, p. 56.
1873. *Planorbis Haldemani* STREBEL, *Beitrag zur Kenntniss der Fauna Mexican.*, p. 44, taf. v, fig. 22.
1884. *Planorbis (Gyrorbis) orbiculus* FISCHER et CROSSE, *Etudes Mollusques terr. et fluvi. Mexique et Guatemala*, Paris, II, p. 70, No. 10, pl. xxxii, fig. 9 à 9c.
1891. *Planorbis orbiculus* PILSBRY, *Proceed. Academy Natur. Sciences Philadelphia*, p. 322.
1899. *Planorbis (Menetus) orbiculus* MARTENS, *Land and Freshwater Mollusca (Biologia Centrali-Americana)*, London, p. 390, No. 6.
1918. *Planorbis orbiculus* BRYANT WALKER, *Synopsis Fresh-Water Mollusca . . . North America, University of Michigan, Miscellaneous Publications* No. 6, Michigan, p. 102.

LOCALITÉ :

Porto-Rico : Humacas ; un exemplaire ; No. M. 4107.¹

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce vit principalement au Mexique : Mexico [LIEBMANN], Tabasco [A. MORELET], Vera-Cruz [BERENDT, H. A. PILSBRY, etc. . .], etc. . . Elle habite aussi le Yucatan [A. MORELET], le Honduras anglais [DE BOCOURT] et le Nicaragua [H. CROSSE].

P. FISCHER et H. CROSSE, après avoir comparé les types du *Planorbis orbiculus* Morelet et du *Planorbis Haldemani* Dunker, concluent à l'identité des deux espèces. Il faut probablement y réunir également le *Planorbis Liebmanni* Dunker,² coquille du Mexique³ et du Nicaragua⁴ établie, selon toute vraisemblance, sur des individus jeunes du *Planorbis (Tropicorbis) orbiculus* Morelet. Cependant H. A. PILSBRY considère le *Planorbis (Tropicorbis) Liebmanni* Dunker comme distinct de l'espèce de A. MORELET dont il se sépare par sa taille plus petite et son dernier tour proportionnellement plus grand.⁵

¹ Cette localité de Porto-Rico est sans doute erronée.

² DUNKER (DR. G.), in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed., XVII, Nürnberg, 1859, p. 59, taf. x, fig. 32 à 34. Également figuré par G. W. BINNEY, *Land and Fresh Water Shells of North America*, II, 1865, p. 108, fig. 182.

³ Notamment à Tampico [A. A. HINKLEY] et aux environs de Vera-Cruz [LIEBMANN].

⁴ F. RÖMER a retrouvé cette coquille, aux États-Unis, dans le Texas où elle a été également recueillie par E. HALL, H. HEMPHILL, J. H. FERRISS et H. A. PILSBRY. Elle vit aussi en Louisiane [H. HEMPHILL] et dans les contrées de Victoria [J. D. MITCHELL] et de Cameron [CLAPP]. Cf. . . H. A. PILSBRY et J. H. FERRISS, *Mollusca of the Southwestern States*, II. *Proceedings Academy Natural Sciences Philadelphia*, LVIII, 1906, p. 165.

⁵ PILSBRY (H. A.), *Land and Fresh Water Mollusca collected in Yucatan, Proceedings Academy Natural Sciences of Philadelphia*, 1891, p. 322.

Planorbis (Tropicorbis) havanensis Pfeiffer.

Pl. II, fig. 16, 17 et 18.

1839. *Planorbis havanensis* PFEIFFER, in : *Wiegmann's Archiv für Natur.*, I, p. 354.
1853. *Planorbis Terverianus* D'ORBIGNY, in : *Ramon de la Sagra, Histoire politique, physique et natur. île de Cuba*, p. 194, No. 113, tab. xii, fig. 20 à 23.
1856. *Planorbis Havanensis* DUNKER, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 58, No. 27, taf. x, fig. 8, 9 et 10.
1865. *Planorbis havanensis* BINNEY, *Land and Fresh Water Shells of North America*, II, p. 107, fig. 181.
1878. *Planorbis havanensis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 241, No. 6.
1886. *Planorbis Terverianus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *loc. supra cit.*, p. 155, No. 135, taf. xxiii, fig. 5.
1890. *Planorbis Terverianus* CROSSE, *Journal de Conchyliologie*, XXXVIII, p. 50, No. 39.
1890. *Planorbis Havanensis* CROSSE, *Journal de Conchyliologie*, XXXVIII, p. 261, No. 379.
1918. *Planorbis havanensis* BRYANT WALKER, *Synopsis Fresh-Water Mollusca . . . North America, University of Michigan, Miscellaneous Publication No. 6, Michigan*, p. 100.

LOCALITÉ :

Antilles : Cuba ; 2 exemplaires.

. DISTRIBUTION GÉOGRAPHIQUE.

Ce *Planorbe* habite les îles de Cuba et de la Trinité [R. J. L. GUPPY]. Le Doct. G. DUNKER [*loc. supra cit.*, 1856, p. 58] mentionne en outre que cette espèce a été découverte au Texas (États-Unis) par le Dr. F. RÖMER. Cette indication n'a pas été confirmée, mais H. A. PILSBRY¹ et A. A. HINKLEY² ont, depuis, signalé ce *Planorbe* aux environs de la Nouvelle-Orléans.

Le *Planorbis havanensis* Pfeiffer³ a une très grande analogie avec le *Planorbis maya* Morelet : même forme générale, même mode d'enroulement en dessus, même mode de sculpture ; mais chez le *Planorbis havanensis* Pfeiffer la taille est plus grande et l'enroulement des tours est, *en dessous*, plus régulier et plus serrés (Pl. ii, fig. 17) que chez le *Planorbis maya* Morelet où il est plié rapide avec un dernier tour proportionnellement plus grand (Pl. I, fig. 17).

¹ PILSBRY (H. A.), Notes on some New Orleans Shells, *Concholog. Exchange*, I, 1886, p. 20.

² HINKLEY (A. A.), New Orleans Mollusca, *The Nautilus*, XVI, Boston, 1912, p. 36.

³ Les individus du Musée d'Histoire naturelle de Calcutta ont 7 millimètres de grand diamètre, 6 millimètres de petit diamètre et 2½ millimètres de hauteur. Leur test est mince, d'un beau corne blond brillant, absolument transparent, orné de stries longitudinales très fines et délicates, mais irrégulières, fortement obliques, subondulenses, plus fortes et plus irrégulières au voisinage de l'ouverture.

Le *Planorbis havanensis* Pfeiffer est encore plus voisin du *Planorbis orbiculus* Morelet dont il se sépare seulement par sa face supérieure plus profondément ombiliquée, son ouverture moins dilatée transversalement et sa forme générale un peu moins comprimée. Les individus de taille un peu plus petite (diamètre maximum : 9 millimètres au lieu de 10 millimètres) et dont le péristome est, *parfois*, légèrement épaissi, correspondent au *Planorbis Terveri* d'Orbigny [*Planorbis Terverianus*].

Planorbis (Tropicorbis) maya Morelet.

Pl. I, fig. 16 à 18.

- 1849. *Planorbis maya* MORELET, *Testacea noviss. insulae Cubanae et Amer. centr.*, pars I, No. 34.
- 1878. *Planorbis maya* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 241, No. 3.
- 1884. *Planorbis maya* FISCHER et CROSSE, *Etudes Mollusques terr. et fluviat. Mexique et Guatemala*, II, Paris, p. 72, No. 12, pl. xxxiii, fig. 4 à 4c.
- 1866. *Planorbis maya* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., Nürnberg, XVII, p. 208, No. 212, taf. xxxii, fig. 2.
- 1891. *Planorbis maya* PILSBRY, *Proceed. Academy Natural Sciences of Philadelphia*, p. 322.
- 1899. *Planorbis (Gyratulus) maya* MARTENS, *Land and Freshwater Mollusca (Biologia Centrali-Americana, London)*, p. 392, No. 8, pl. xxi, fig. 13.

LOCALITÉ :

Yucatan : Sans indication précise de localité [Collect. A. MORELET] ; *colotypes* ; 4 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe habite le Mexique : environs de Campêche et province de Yucatan [A. MORELET, H. A. PILSBRY] ; isthme de Tehuantepec [F. SUMICHRAST] ; etc. . . et le Guatemala, dans la région d'Antiqua [H. CLESSIN, H. STOLL].

Coquille de taille médiocre, subaplatie en dessus avec une dépression centrale médiocrement marquée, concave en dessous ; spire composée de 4½ à 5 tours arrondis, un peu comprimés, à croissance assez rapide mais régulière ; dernier tour grand, subanguleux, dilaté à son extrémité ; sutures profondes ; ouverture obliquement ovale transverse, vaguement anguleuse à la base ; bord supérieur du labre subhorizontal ; bord inférieur arqué ; bords marginaux convergents mais écartés, réunis par une mince callosité blanche.

Diamètre maximum : 6½ millimètres ; diamètre minimum : 5½ millimètres ; hauteur : 2 millimètres ; diamètre de l'ouverture : 2½ millimètres ; hauteur de l'ouverture : 2½ millimètres.¹

¹ Ces dimensions, qui correspondent à celles des exemplaires du Musée d'Histoire naturelle de Calcutta, sont très souvent dépassées, le *Planorbis (Tropicorbis) maya* Morelet atteignant jusqu'à 11½ millimètres de diamètre maximum sur 9 millimètres de diamètre minimum.

Test mince, fragile, presque transparent, assez brillant, de couleur de corne claire, moins foncé en dessous qu'en dessus, orné de stries longitudinales fines, serrées, un peu irrégulières, obliquement onduleuses, légèrement plus délicates en dessous qu'en dessus.

Le *Planorbis maya* Morelet appartient à un groupe de petits Planorbes vivant dans les lacs et rivières de l'Amérique centrale et qui sont tous fort voisins les uns des autres. Il a beaucoup d'affinités avec le *Planorbis (Tropicorbis) retusus* Morelet,¹ mais ce dernier est plus petit (diamètre maximum : 8 millimètres ; hauteur : 2½ millimètres), son dernier tour est mieux dilaté et son ouverture plus transverse.²

Le *Planorbis (Tropicorbis) petenensis* Morelet³ est également voisin du *Planorbis (Tropicorbis) maya* Morelet, mais il est encore plus petit (diamètre maximum : 5 millimètres ; hauteur : 2½ millimètres), plus concave en dessous ; sa spire se compose de 5 tours arrondis dont le dernier est plus étroit.⁴

Sensiblement de même taille (diamètre : 5 millimètres ; hauteur : 2 millimètres),⁵ le *Planorbis (Tropicorbis) hondurasensis* Clessin⁶ est une petite coquille dont la spire est formée de 4 tours arrondis le dernier grand et à peine dilaté à son extrémité.⁷

Le *Planorbis (Tropicorbis) aeruginosus* Morelet⁸ ne possède également que 4 tours de spire subconvexes ; il est de faible taille (diamètre maximum : 4½ millimètres ; hauteur : 2 millimètres) et sa face inférieure est plus étroitement et plus profondément ombiliquée.⁹

Le *Planorbis (Tropicorbis) tepicensis* Martens¹⁰ est encore très voisin des Planorbes précédents. C'est une coquille assez solide,

¹ MORELET (A.), *Testacea noviss. insulae Cubanae et Americ. central.*, pars I, 1849, No. 38. Espèce figurée par P. FISCHER et H. CROSSE, *Etudes sur les Mollusques terr. et fluvial. Mexique et Guatemala*, II, Paris, Impr. nation., 1884, p. 73-74, pl. xxxii, fig. 10-10c.

² Le *Planorbis retusus* Morelet habite le Yucatan [A. MORELET, A. HEILPRIN].

³ MORELET (A.), *loc. supra cit.*, pars II, 1851, p. 114 ; = P. FISCHER et H. CROSSE, *loc. supra cit.*, II, 1884, p. 74, No. 14, pl. xxxii, fig. 5-5c.

⁴ Le *Planorbis petenensis* Morelet vit au Mexique, dans l'isthme de Tehuantepec [F. SUMICHRIST] et au Guatemala, dans le lac Izta (province de Peten) [A. MORELET].

⁵ CLESSIN (S.), *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1886, p. 164, No. 149, ta xxiv, fig. 2.

⁶ S. CLESSIN (*loc. supra cit.* p. 164) donne : "diam. : 8 mill., alt. : 3 mill." ; mais le Dr. E. von MARTENS [Land and Fresh Water Mollusca, *Biologia Centrali-Americana*, p. 393, note infra paginale (feuille 50, datée d'Avril 1899)] dit : "Clessin gives the locality as 'Sta. Maria, Honduras.' but on the label in Dunker's collection it is clearly written 'Sta. Rosa.' His measurements 'diam. 8, alt. 3 mill., are also incorrect (they should be diam. 5, alt. 2), according to a letter received from him in October 1898. Dunker's largest specimen measures diam. 7, alt. 2½ mill."

⁷ Le *Planorbis hondurasensis* Clessin habite le Honduras [J. HJALMARSON] et le Costa Rica [P. BLOLEY].

⁸ MORELET (A.), *loc. supra cit.*, pars II, 1851, No. 115 ; = P. FISCHER et H. CROSSE, *loc. supra cit.*, II, 1884, p. 74, No. 15, pl. xxxii, fig. 8-8c.

⁹ Le *Planorbis aeruginosus* Morelet habite les marécages et le lac d'Yzabal (Guatemala) [A. MORELET].

¹⁰ MARTENS (Dr. E. von), *loc. supra cit.*, Avril 1899, p. 393, No. 11, pl. xxi, fig. 14 *Planorbis (Gyraulus) tepicensis*.

d'un fauve corné, finement striée, de petite taille (diamètre maximum : 6 millimètres ; hauteur : $1\frac{1}{2}$ millimètre) et dont la spire est formée de 4 tours convexes à croissance régulière, le dernier occupant, au voisinage de l'ouverture, le tiers environ du diamètre total. Le caractère le plus remarquable de cette espèce est la bordure blanche qui garnit l'intérieur de l'ouverture.¹

Quant au *Planorbis* (*Tropicorbis*) *orbiculus* Morelet,² il semble mieux individualisé : son dernier tour est beaucoup plus dilaté que chez le *Planorbis* (*Tropicorbis*) *maya* Morelet, sa spire comprend seulement 4 tours et sa face inférieure est plus fortement concave.

En résumé tous ces *Planorbis* sont extrêmement voisins les uns des autres et les caractères qui les séparent semblent bien faibles. Je crois qu'il s'agit d'une seule espèce, répandue dans toute l'Amérique centrale, et présentant un polymorphisme encore mal connu.

Sous-genre *Bathyomphalus* Agassiz, 1837.

- 1887. *Bathyomphalus* AGASSIZ in : DE CHARPENTIER, *Catalogue Mollusques terr. liv. Suisse* (*Denschr. Schweiz. Gesellsch. Naturforsch.*, Neuchâtel, I), p. 20.
- 1840. *Bathyomphalus* HARTMANN, *Systematische Übersicht der Europäischen Gattungen* (Tableau paru, en 1840, avec la 1^{re} livraison des *Erd-und Süßwasser-Gasteropoden d. Schweiz*, St Gallen).
- 1847. *Polygyrus* GRAY, *Proceedings Zoological Society of London*, p. 181 (non : BECK, 1837 ; non : *Polygyra* SAY, 1818).
- 1850. *Discodina* STEIN, *Die lebenden Schnecken u. Muscheln d. Umgegend Berlins*, Berlin, p. 82.
- 1855. *Bathyomphalus* MOQUIN-TANDON, *Histoire Mollusques terr. fluviat. France*, II, Paris, p. 423 et p. 443.
- 1885. *Bathyomphalus* WESTERLUND, *Fauna d. palaarct. region Binnenconchylien*, V, p. 74, No. 5.
- 1886. *Bathyomphalus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 34, No. 10.
- 1902. *Bathyomphalus* WESTERLUND, *Acta Acad. sc. Slav. Meridion. Zagrabiae*, CLI, p. 120.
- 1905. *Bathyomphalus* DALL, *Land and Freshwater Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New-York, p. 83 et p. 86.

Coquille petite, relativement haute ; spire composée de nombreux tours à enroulement très dissemblable en dessus et en dessous ; enroulement très lent et très régulier en dessus, plus rapide en dessous, dernier tour petit, arrondi ; coquille modérément ombiliquée en dessous ; ouverture très étroitement semi-lunaire.

Type : *Planorbis contortus* Linné.

Le sous genre *Bathyomphalus* renferme seulement quelques espèces vivant dans les eaux douces de l'Europe.

¹ Le *Planorbis tepicensis* Martens habite le Mexique, à Tepic, dans l'état de Jalisco [W. RICHARDSON].

² Voir, au sujet de cette espèce, p., 92 de ce Mémoire.

Planorbis (Bathyomphalus) contortus Linné.

1758. *Helix contorta* LINNÉ, *Systema Naturae*, Ed. X, p. 770.
 1774. *Planorbis contortus* MÜLLER, *Vermium terrest. et fluviat. histor.*, II, p. 162.
 1778. *Helix crassa* DA COSTA, *British Conchology*, p. 66, pl. iv, fig. 11 [non : *Helix crassa* RAZOUMOWSKI].
 1799. *Helix umbilicata* PULTNEY, *Catal. Dorset.*, p. 47, pl. xx, fig. 11.
 1805. *Planorbis contortus* DRAPARNAUD, *Histoire Mollusques France*, p. 42, pl. i, fig. 39 à 41.
 1835. *Planorbis contortus* ROSSMÄSSLER, *Iconographie der Land-und Süßwasser-Mollusk.*, V, p. 16, taf. vii, fig. 117.
 1851. *Planorbis contortus* DUPUY, *Histoire Mollusques terr. fluviat. France*, p. 433, pl. xxi, fig. 2.
 1855. *Planorbis contortus* MOQUIN-TANDON, *Histoire Mollusques terr. fluviat. France*, II, Paris, p. 443, pl. xxi, fig. 24 à 31.
 1875. *Planorbis contortus* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 109, No. 11.
 1878. *Planorbis (Bathyomphalus) contortus* NEVILL, *Hand List Mollusca Indian Museum Calcutta*, p. 246, No. 51.
 1878. *Planorbis contortus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. ii, fig. 9a—9b.
 1882. *Planorbis contortus* LOCARD *Prodrome, Catalogue Mollusques terr. fluvi. France*, Lyon et Paris, p. 192.
 1885. *Planorbis contortus* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 74, No. 16.
 1886. *Planorbis contortus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 73, No. 47, taf. xiv, fig. 17 à 20.
 1893. *Planorbis contortus* LOCARD, *Coquilles terr. fluviatiles France*, Lyon et Paris, p. 59, fig. 48 à 50.
 1913. *Planorbis (Bathyomphalus) contortus* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 256, fig. 307 et 308.

LOCALITÉS :

Angleterre : sans localité précise [Collect. G. NEVILL].

France : environs de Marseille (Bouches-du-Rhône).

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe vit dans toute l'Europe, y compris les îles Shetland [G. JEFFREYS ¹], la Suède et la Norvège [C. A. WESTERLUND ²], la Laponie [Dr. C. DE WALLENBERG ³] et le nord de la Russie [A. E. NORDENSKIÖLD et A. E. NYLANDER ⁴]; il pénètre, à travers toute la Sibérie [C. A. WESTERLUND ⁵] jusqu'au terri-

¹ JEFFREYS (G.), *Annals and Magazine of Natural History*, London, Octobre 1868.

² WESTERLUND (C. A.), *Exposé critique Mollusques terr. eau douce Suède et Norvège*, Upsal, 1871, p. 130.

³ WALLENBERG (Dr. C. DE), *De Molluscis Lapponiae Lulensis* (Dissert. inaugur.), Berol., 1858, p. 32.

⁴ NORDENSKIÖLD (A. E.) et NYLANDER (A. E.), *Finlands Mollusker*, Helsingfors, 1856 p. 62.

⁵ WESTERLUND (C. A.), *Sibiriens Land-och Sötvatten-Mollusker*, Stockholm, 1877, p. 58 et p. 108.

toire de l'Amour [L. von SCHRENCK¹]. Vers le sud, le *Planorbis contortus* Linné devient moins abondant, mais il habite encore l'Espagne, le Portugal, l'Italie, où il a été signalé par de nombreux auteurs.² Par contre, il manque complètement dans l'Afrique Mineure (Maroc, Algérie et Tunisie), mais pénètre, en Asie, jusqu'aux territoires situés au sud de la mer Caspienne [O. BOETTGER³].

Dans le nord de la Suède et de la Russie, le *Planorbis (Bathyomphalus) contortus* Linné est partiellement remplacé par une espèce voisine, le *Planorbis (Bathyomphalus) dispar* Westerlund⁴ qui se distingue surtout par sa face inférieure beaucoup plus largement mais bien moins profondément ombiliquée.⁵

Sous-genre *Gyraulus* Agassiz, 1837.

- 1827. *Planaria* BROWN, *Illustrations Recent Conchology Great Britain and Ireland*, London, pl. li. fig. 48, 49^{1a} [non : *Planaria* MÜLLER, 1776].
- 1837. *Gyraulus* AGASSIZ in : DE CHARPENTIER, *Catalogue Mollusques terr. fluviat. Suisse (Denschr. Schweiz. Gesellsch. Naturforsch., Neuchâtel, I)*, p. 21.
- 1837. *Gyraulus* GRAY in : TURTON, *A Manual Land and Fresh water Shells Brit. Islands*, 2^e Edit., London, p. 234.
- 1840. *Gyraulus* HARTMAN, *Systematische Übersicht der Europäischen Gattungen* (Tableau paru, en 1840, avec la 1^{re} livraison de l'ouvrage ci-dessous mentionné : HARTMANN, 1844).
- 1841. *Trochlea* HALDEMAN, *American Journal of Science*, XLII, p. 216.
- 1844. *Gyraulus* HARTMANN, *Erd-und Süsswasser-Gasteropoden d. Schweiz*, Saint-Gallen, V, p. 89.
- 1850. *Nautilina* STEIN, *Die lebenden Schnecken u. Muscheln d. Umgegend, Berlins*, Berlin, p. 80 (part. = *Gyraulus* + *Armiger*).
- 1855. *Gyraulus* MOQUIN-TANDON, *Histoire Mollusques terr. fluviat France*, II, Paris, p. 423.
- 1855. *Gyraulus* MOQUIN-TANDON, *loc. supra cit.*, II, p. 438.
- 1885. *Gyraulus* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, p. 75, No. 6.
- 1886. *Gyraulus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 33, No. 7.

¹ SCHRENCK (L. von), *Mollusken des Amur-Landes und der Nordjapanischen Meeres, Reisen und forschungen Amur-Lande, 1854—1856*, Saint-Petersbourg, III, 1859—1867, p. 641.

² En Espagne par le Dr. G. SERVAIN ; au Portugal par A. LOCARD, A. MORELET, A. NOBRE ; en Italie par G. B. ADAMI, M. PAULUCCI, C. POLLONERA, C. PORRO, C. A. STATUTI, etc. . . .

³ BOETTGER (O.), *Mollusca*, in : RADDE (DR. G.), *Die Fauna und Flora des Südwestlichen Caspi-Gebietes*, Leipzig, 1886, p. 327, No. 63.

⁴ WESTERLUND (C. A.), *Exposé critique Mollusques terr. eau douce Suède et Norvège*, Upsal, 1871, p. 131 ; = *Fauna Molluscor. Suec. Norveg. et Daniae*, 1873, p. 390 ; = *Fauna der paläarkt. region Binnenconchylien*, V, 1885, p. 74 ; = CLESSIN (S.), *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 103, No. 67, taf. xix, fig. 10. [= *Planorbis contortus* FRIELE, *Norske Mollus* 1853, p. 32 (non LINNÉ) ; = *Planorbis contortus* NORDENSKJÖLD et NYLANDER, *Finlands Mollusker*, Helsingfors, 1856, p. 62, taf. iv, fig. 50 (non LINNÉ) ; = *Planorbis contortus* var. *B. dispar* WESTERLUND, *Malakozoolog. Blätter*, XXII, 1875, p. 109.]

⁵ Cette espèce vit seulement dans l'extrême nord de l'Europe : provinces septentrionales de la Suède [C. A. WESTERLUND] et de la Russie [A. E. NORDENSKJÖLD et A. E. NYLANDER ; = C. A. WESTERLUND].

1899. (Avril) *Gyraulus* MARTENS, Land and Freshwater Mollusca (*Biology Centrali-Americana*, London), p. 392.
 1902. *Gyraulus* WESTERLUND, *Acta Acad. Sc. Slav. Merid. Zagrabiae*, CL, p. 121.
 1905. *Gyraulus* DALL, Land and Freshwater Mollusks Alaska, *Harriman Alaska Expedition*, XIII, New-York, p. 83 et p. 86.

Coquille petite, déprimée; spire composée d'un petit nombre de tours à croissance rapide ou très rapide; dernier tour toujours grand, dilaté à son extrémité, muni d'une carène périphérique plus ou moins accentuée; test généralement garni d'une sculpture réticulée ou hispide.

Type: *Planorbis albus* Müller.

Le sous-genre *Gyraulus* est celui qui renferme le plus grand nombre d'espèces; ces dernières ont une distribution universelle.

§ I.

Planorbis (Gyraulus) albus Müller.

1774. *Planorbis albus* MÜLLER, *Vermium terrest. et fluvial. Histor.*, II p. 164.
 1789. *Helix alba* GMELIN, *Systema natur.*, Ed. XIII, p. 3625, No. 29.
 1801. *Planorbis villosus* POIRET, *Coquilles Aisne, environs Paris*, Prodrome, p. 95.
 1801. *Planorbis hispidus* VALLOT, *Exerc. Histoire naturelle*, Dijon, p. 5.
 1805. *Planorbis hispidus* DRAPARNAND, *Histoire Mollusques France*, p. 43, pl. I, fig. 45 à 48.
 1826. *Planorbis reticulatus* RISSO, *Histoire natur. Europe méridionale*, IV, p. 98.
 1851. *Planorbis albus* DUPUY, *Histoire Mollusques terr. fluvial. France*, p. 435, pl. xxi, fig. 4.
 1855. *Planorbis albus* MOQUIN-TANDON, *Histoire Mollusques terr. fluvial France*, II, Paris, p. 440, pl. xxxi, fig. 12 à 19.
 1875. *Planorbis albus* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 110, No. 12, taf. iv, fig. 1 à 3.
 1878. *Planorbis albus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. iii, fig. 17.
 1878. *Planorbis albus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 245, No. 39.
 1882. *Planorbis albus* LOCARD, *Prodrome, Catalogue Mollusques terr. fluvial. France*, Lyon et Paris, p. 191.
 1885. *Planorbis albus* WESTERLUND, *Fauna der paläarct. region Binnconchylien*, V, p. 76, No. 17.
 1886. *Planorbis albus* CLESSIN, *Die Familie der Linnæiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 94, No. 62, taf. xiv, fig. 9 à 12.
 1893. *Planorbis albus* LOCARD, *Coquilles fluviatiles France*, Lyon et Paris, p. 59, fig. 51—52.
 1913. *Planorbis (Gyraulus) albus* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 258, fig. 305.

LOCALITÉS :

Angleterre : sans localité précise [G. Nevill]; six exemplaires ; No. A. 8.

Espagne : Burgos.

France : Aix-en-Provence (Bouches-du-Rhône).

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis* (*Gyraulus*) *albus* Müller vit dans toute l'Europe, y compris, au nord, la Suède et la Norvège [C. A. WESTERLUND¹], la Laponie [DR. C. DE WALLENBERG²], le nord de la Russie d'où il s'étend, à travers la Sibérie [C. A. WESTERLUND,³ A. von MIDDENDORFF⁴] jusqu'au territoire de l'Amour [L. SCHRENCK⁵], au Kamtschatka [GEBLER⁶] et jusque dans l'Amérique du Nord.⁷ Au sud, on le retrouve en Espagne [Dr. G. SERVAIN⁸] et au Portugal [A. LOCARD,⁹ A. MORELET¹⁰]. Enfin, vers l'Orient, le *Planorbis albus* Müller qui habite encore la Serbie, le Montenegro, etc. . . . [OTTO WOHLBEREDT¹¹], pénètre jusqu'au Turkestan [Dr. E. von MARTENS¹²].

Les exemplaires du Musée d'Histoire naturelle de Calcutta que j'ai examinés sont à peu près typiques et ne sauraient être rapportés à la forme voisine, le *Planorbis* (*Gyraulus*) *Crossei* Bourguignat qui¹³ se distingue principalement par sa spire à enroulement plus lent et plus régulier dont le dernier tour, proportionnellement moins développé, est beaucoup moins dilaté vers l'ouverture.¹⁴

Les échantillons appartenant au Musée de Calcutta et provenant de Burgos (Espagne) sont de grande taille (diamètre maximum atteignant jusqu'à 7½—8 millimètres alors que le type mesure seulement 6 millimètres de diamètre maximum) et ont un

¹ WESTERLUND (C. A.) *Exposé critique Mollusques terrestres, eau douce Suède et Norvège*, Upsal, 1871, p. 131.

² WALLENBERG (Dr. C. DE), *De Molluscis Lapponiae Luleensis* (Dissert. inaug., Berol., 1858), p. 37 et p. 38.

³ WESTERLUND (C. A.), *Sibiriens Land-öch Sötratten; Mollusker*, Stockholm, 1877, p. 59 et p. 108.

⁴ MIDDENDORFF (A. von), *Reise in den äussersten Norden und Osten Sibiriens*, II, part I, Saint-Petersbourg, 1851, p. 404.

⁵ SCHRENCK (L. von), *Mollusken des Amur-Landes und der Nordjapanischen Meeres, Reisen und forschungen Amur-Lande*, Saint Petersburg, II, 1859—1867, p. 639.

⁶ GEBLER, *Bulletin société impériale naturalistes Moscou*, I, 1829, p. 185.

⁷ Le *Planorbis* (*Gyraulus*) *albus* Müller, n'a été que fort rarement signalé dans l'Amérique du Nord; mais certains naturalistes américains considèrent les *Planorbis* (*Gyraulus*) *hirsutus* Gould et *Planorbis* (*Gyraulus*) *deflectus* Say comme identiques à l'espèce d'Europe. Cf., à ce sujet, l'article consacré au *Planorbis* (*Gyraulus*) *borealis* Lovén, p. 105, de ce Mémoire.

⁸ SERVAIN (Dr. G.), *Etude sur les Mollusques recueillis en Espagne et en Portugal*, St. Germain, 1880, p. 141.

⁹ LOCARD (A.), *Conchyliologie portugaise. Les Coquilles terrestres, des eaux douces et saumâtres. Archives Muséum Hist. natur. Lyon*, VII, 1899, p. 181.

¹⁰ MORELET (A.), *Description des Mollusques terrestres et fluviatiles du Portugal*, Paris, 1845, p. 80.

¹¹ WOHLBEREDT (OTTO), *Zur Fauna Montenegros und Nordalbanien, Wissenschaftl. Mitteilung. aus Bosnien und der Herzegowina*, XI, 1909, p. 688 (tirés à part, p. 104).

¹² MARTENS (Dr. E. von), *Ueber Centralasiatische Mollusken, Mémoires Académie impériale Sciences Saint-Petersbourg*, XXX, No. 11, 1882, p. 42 et p. 50.

¹³ BOURGUIGNAT (J. R.), *Malacologie du lac des quatre Cantons*, Paris, Novembre 1862, p. 42, pl. i, fig. 13 à 16 (*Planorbis Crosseanus*).

¹⁴ Le *Planorbis Crossei* Bourguignat a été signalé en de nombreuses localités de l'Europe centrale. En France il est surtout abondant dans l'ouest où il semble remplacer partiellement le *Planorbis albus* Müller [GERMAIN (LOUIS), *Etude sur les Mollusques terrestres et fluviatiles des environs d'Angers et du département de Maine-et-Loire*, I, 1903, p. 202].

test assez solide et fortement encroûté. Les individus d'Aix-en-Provence (France, département des Bouches-du-Rhône) sont beaucoup plus petits (diamètre maximum variant de 3 à 3½ millimètres) et leur test est subtransparent.

Planorbis (Gyraulus) devians Porro.

1838. *Planorbis devians* PORRO, *Malacol. terr. fluv. della Provincia Comasca*, p. 84, No. 71-VII, tav. i, fig. 6.
 1838. *Planorbis substriatus* MEGERLE von MÜHLELDT-MSS in : PORRO, *loc. supra cit.*, p. 84.
 1844. *Planorbis deformis* HARTMANN, *Erd-und Süßwasser-Gasterop. d. Schweiz*, p. 95 et p. 118, taf. xxvii, fig. 1 à 5, taf. xxxv, fig. 1 à 6, taf. xxxvi, fig. 1 à 7 et taf. lix, fig. 4 et 5.
 1871. *Planorbis deformis* WESTERLUND, *Exposé critique Mollusques terr. eau douce Suède et Norvège*, Upsal, p. 133 et p. 198.
 1871. *Planorbis cavatus* WESTERLUND, *loc. supra cit.*, p. 133.
 1875. *Planorbis deformis* WESTERLUND, *Malakozoolog. Blätter*, XXII, pp. 80—82.
 1875. *Planorbis devians* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 112, No. 15, taf. iv, fig. 13 à 15.
 1877. *Planorbis deformis* CLESSIN, *Deutsch. Excursions . . . Mollusken-Fauna*, p. 413, fig. 268.
 1881. *Planorbis devians* WESTERLUND, *Öfversigt Kongl. Vetenskaps-Akadem. Förhandlingar*, Stockholm, No. 4, p. 64.
 1881. *Planorbis devians* WESTERLUND, *loc. supra cit.*, No. 4, p. 64.
 1885. *Planorbis deformis* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 83, No. 46.
 1886. *Planorbis albus* var. 5 *devians* CLESSIN, *Die Familie der Læmnæiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed. XVII, Nürnberg, p. 98, taf. x, fig. 23 à 25.

LOCALITÉ :

Suisse : Lac de Constance.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe vit, d'après C. A. WESTERLUND,¹ en Suisse, en Bavière et dans l'Italie septentrionale.²

Cette coquille n'est bien certainement qu'une forme du *Planorbis (Gyraulus) albus* Müller, peut-être connue du Baron de FÉRUSSAC³ et que CARLO PORRO définit de la manière suivante :

"Pl. testa alba, laevi, supra convexa, subtus concava. aut latissime umbilicata ; anfractibus subrotundis, ultimo maximo,

¹ En 1881, dans ses *Malakologiska Bidrag*, C. A. WESTERLUND [*Malak. Bidrag*, II : För Vetenskapen nya Land-öch Sötvatten-Mollusker, *Öfversigt of Kongl. Vetensk.-Akad. Förhandlingar*, Stockholm, No. 4, 1881, p. 64] donne comme habitat à cette espèce : " Helvetia, Bavaria, Italia bor. " En 1885 [*Fauna der paläarct. region Binnenconchylien*, V, p. 83] il dit seulement. " Bodensee u. seen der bayr. Alpen ".

² Il a notamment été signalé dans le Piémont par CARLO POLLONERA [*Elenco dei Molluschi fluviatili viventi in Piemonte, Bollettino Musei Zoologia ed Anatomia comparata di Torino*, IV, No. 72, 15 décembre 1889, p. 6 et p. 7 (sous les noms de *Planorbis deformis* Hartmann et de *Planorbis devians* Porro)].

³ C'est peut être ce Planorbe qui a été désigné par DE FÉRUSSAC sous le nom de *Planorbis acronicus*.

ad inferum deviante; peristomate simplici; apertura magna subovali.

"Alt. mill. 2, lat. : mill. 6, aufract. mill. 4" ¹.

Le *Planorbis deformis* Hartmann est certainement synonyme de cette forme à laquelle il faut encore rapporter le *Planorbis cavatus* Westerlund. Cette opinion a d'abord été celle de C. A. WESTERLUND lui-même ² et ce n'est que plus tard qu'il a séparé les *Planorbis deformis* Hartmann et *Planorbis devians* Porro en les considérant d'abord comme espèces distinctes ³ puis en subordonnant, comme variété, la seconde à la première. ⁴

Planorbis (Gyraulus) Bourguignati Moitessier.

1867. *Planorbis Bourguignati* MOITESSIER, *Revue et Magasin de Zoologie*, p. 423, pl. xxii, fig. 1 à 6.
1868. *Planorbis Bourguignati* MOITESSIER, *Malacologie départ. Hérault*, p. 52, pl. i, fig. 1 à 6.
1868. *Planorbis Paladilhei* MOITESSIER, *loc. supra cit.*, p. 53, pl. i, fig. 7 à 14.
1881. *Planorbis bourguignati* WESTERLUND, *Öfversigt Kongl. Vetenskaps-Akadem. Förhandlingar*, Stockholm, No. 4, p. 64.
1881. *Planorbis bourguignati* variété *paladilhi* WESTERLUND, *loc. supra cit.*, No. 4, p. 64.
1882. *Planorbis Bourguignati* LOCARD, *Prodrome, Catalogue Mollusques terr.-fluvial. France*, Lyon et Paris, p. 191.
1882. *Planorbis Paladilhei* LOCARD, *loc. supra cit.*, p. 191. ⁵
1885. *Planorbis bourguignati* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, p. 77, No. 19.
1885. *Planorbis bourguignati* forma 1 *paladilhi* WESTERLUND, *loc. supra cit.*, V, p. 77, n° 19.
1893. *Planorbis Bourguignati* LOCARD, *Coquilles fluviales France*, Lyon et Paris, p. 60.
1893. *Planorbis Paladilhei* LOCARD, *loc. supra cit.*, p. 61.
1902. *Planorbis Bourguignati* BÉRENGUIER, *Malacographie départ. Var.*, p. 358.
1913. *Planorbis (Gyraulus) Bourguignati* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 257.

¹ PORRO (CARLO), *Malacologia terrestre e fluviale della Provincia Comasca*, Milano, 1838, p. 84.

C. PORRO ajoute comme habitat et localité (*loc. supra cit.*, p. 85): "Raro nei laghi di Pusiano ed Alserio nella Brianza."

² WESTERLUND, (C. A.) *Malakologische Studien, Kritiken und Notizen*, *Malakozoolog. Blätter*, XXII, 1875, p. 112.

³ WESTERLUND (C. A.), *loc. supra cit.*, Stockholm, 1881, p. 64. On est tout surpris de voir C. A. WESTERLUND, qui connaissait si bien la faune malacologique européenne, considérer, dans cette note, le *Planorbis euphraticus* MOUSSON [Coquilles terrestres et fluviales recueillies par M. le Dr. AUGUSTE MOUSSON dans l'Orient, *Journal de Conchyliologie*, janvier 1874, n° 40, No. 10, et p. 55, No. 1 (*Planorbis [Gyraulus] devians* var. *Euphraticus*)] comme variété du *Planorbis devians* Porro. En réalité l'erreur sur tout d'abord été commise par A. MOUSSON lui-même dont l'espèce est une des nombreuses formes représentatives, propres à l'Asie antérieure, du *Planorbis (Gyraulus) albus* Müller de l'Europe.

⁴ WESTERLUND (C. A.), *loc. supra cit.*, V, p. 83 [*Planorbis deformis* Hartmann, variété *cavatus* (Westerlund)] Observons que, de toute manière, le nom de C. PORRO, étant le plus ancien, le vocable *devians* doit être substitué à celui de *cavatus*.

⁵ A. LOCARD [*Prodrome de la Malacologie française; Catalogue général de Mollusques terrestres, des eaux douces et des eaux saumâtres*, 1882, p. 191] donne comme synonyme du *Planorbis Paladilhei* Moitessier, le *Planorbis albus* DUBREUIL.

LOCALITÉ :

Irlande : Lac d' Ossegor ; No. P. 117 B.

DISTRIBUTION GÉOGRAPHIQUE.

Ce rare Planorbe était seulement connue de quelques localités françaises disséminées dans les départements de l'Hérault [P. A. MOITESSIER] et du Var [P. BÉRENGUIER¹]. Il avait également été retrouvé au Piémont (Italie), par CARLO POLLONERA.²

Coquille discoïde, presque plate en dessus avec une dépression centrale étroite et assez profonde ; concave en dessous avec une cavité ombilicale large et profonde ; spire composée de $4-4\frac{1}{2}$ — $4\frac{3}{4}$ tours arrondis à croissance rapide, le dernier grand, subovalaire-anguleux, nettement dilaté à l'extrémité à la manière du *Planorbis* (*Gyraulus*) *Crossei* Bourguignat ; sutures profondes, comme subcanaliculées ; ouverture très oblique, transversalement ovulaire-oblongue ; péristome simple, tranchant, bord supérieur bien plus avancé que l'inférieur, subconvexe dans une direction légèrement descendante, bords marginaux convergents, rapprochés, réunis par une callosité blanche parfois notablement épaissie.

Diamètre maximum : $4-5\frac{1}{2}$ millimètres ; diamètre minimum : $3\frac{1}{4}-4\frac{1}{2}$ millimètres ; hauteur maximum : $1\frac{3}{4}-2$ millimètres ; hauteur de l'ouverture : 2 millimètres ; diamètre de l'ouverture : $2\frac{1}{4}$ millimètres.

Test un peu épais, assez solide, corné fauve ou brun avec, en dessus : des stries longitudinales très obliques, un peu onduleuses, irrégulièrement distribuées et inégales (stries très fortes, subcostulées, entre lesquelles sont des stries plus fines) coupées de stries spirales fines et serrées ; — et, en dessous : une ornementation sculpturale analogue, mais plus régulière, les stries longitudinales subcostulées étant un peu plus accentuées.

Cette description correspond aux exemplaires du Musée d'Histoire naturelle de Calcutta dont quelques uns ont un dernier tour fortement descendant à l'extrémité. Il y a là, sans doute, une déformation de la coquille.

Le *Planorbis Paladilhei* Moitessier est certainement synonyme de cette espèce dont il n'est peut être que le jeune âge. Les caractères qui le séparent, d'après P. A. MOITESSIER, du

[*Catalogue Mollusques Hérault*, 2^e Edit., 1869, p. 55]. Dans la 3^e édition de son *Catalogue des Mollusques de l'Hérault* (1880, p. 160), DUBREUIL, déclare n'avoir jamais rencontré ni le *Planorbis Bourguignati* Moitessier, ni le *Planorbis Paladilhei* Moitessier.

¹ Dans ses *Malakologiska bidrag* [II : För Veten kapen nya Land-och Sötvatten-Mollusker, Öfversigt Kongl. Vetenskaps-Akad. Förhandlingar, 1881, Stockholm, No. 4, p. 64], C. A. WESTERLUND donne une liste laalytique des Planorbes d'Europe appartenant au sous-genre *Gyraulus* dans laquelle il indique, comme habitat du *Planorbis Bourguignati* Moitessier, la France et la Bavière. Cette dernière indication n'est pas reproduite par C. A. WESTERLUND dans sa *Fauna der paläarkt. region Binnencnchylien*, V, Lund, 1885, p. 77.

² POLLONERA (CARLO), Elenco dei Molluschi fluviatili viventi in Piemonte, *Bollettino d. Musei Zoologia Anatom. compar. R. Univers. di Torino*, IV, No. 72, 15 Décembre 1889, p. 6, No. 27.

Planorbis Bourguignati Moitessier sont, en effet, la taille plus faible (diamètre: 5 millimètres; hauteur: 2 millimètres¹) et une spire à croissance un peu moins rapide avec un dernier tour plus nettement subanguleux. La sculpture est identique.

Le *Planorbis (Gyraulus) Bourguignati* Moitessier rappelle, par sa forme générale et son mode d'enroulement, le *Planorbis (Gyraulus) albus* Müller et, surtout, le *Planorbis (Gyraulus) Crossei* Bourguignat, mais il s'en sépare par son ornementation sculpturale caractérisée par la présence de stries longitudinales élevées ayant l'apparence de petites côtes.

Planorbis (Gyraulus) Gredleri Bielz.

- 1859 *Planorbis Gredleri* BIELZ in GREDLER, *Tirols Land- und Süsswasser-Mollusk.*, II, p. 9.
 1871 *Planorbis Gredleri* WESTERLUND, *Exposé critique Mollusques terri-
eau douce Suède et Norvège*, Upsal, p. 133.
 1873 *Planorbis gredleri* WESTERLUND, *Fauna Molluscor Suec. Norveg.
et Daniæ*, p. 396.
 1875 *Planorbis gredleri* WESTERLUND, *Malakozoolog. Blätter*, XXII, p.
111, No 13, taf. ii, fig. 15 à 18.
 1881. *Planorbis (Gyraulus) gredleri* WESTERLUND, *Öfversigt af Kongl.
Vetenskaps-Akad. Förhandlingar*, Stockholm, No. 4, p. 64.
 1885 *Planorbis gredleri* WESTERLUND, *Fauna der palaarct. region Bim-
nenconchylien*, V, p. 79, No. 32.
 1886 *Planorbis Rossmussleri* variété *Gredleri* CLESSIN, *Die Familie der
Limnaeiden*, in MARTINI et CHEMNITZ, *Systemat. Conchylien-
Cabinet*, 2^e Édit., Nürnberg, XVII, p. 101.

LOCALITÉ :

Allemagne : sans localité précise; un exemplaire adulte et deux jeunes.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce vit en Suède [DR. F. SÖDERLUND, E. HEMBERG], en Norvège [R. COLLET, O. NORDSTEDT, O. S. JENSEN], en Finlande [S. CLESSIN], en Allemagne et au Tyrol [C. A. WESTERLUND].

Le *Planorbis (Gyraulus) Gredleri* Bielz est une espèce rare possédant un test solide, peu luisant, d'un brun corné parfois teinté de verdâtre. Le dernier tour, qui n'est pas dilaté à l'extrémité, est presque arrondi; l'angulosité carénale étant fort obsolète. L'ornementation sculpturale est extrêmement délicate : les stries longitudinales, très fines, un peu serrées, irrégulières et obliques sont coupées par des stries spirales d'une grande délicatesse. La taille de ce Planorbe ne dépasse pas 7 millimètres de diamètre maximum.

¹ Le type mesure 6½ millimètres de diamètre maximum et 2½ millimètres de hauteur maximum.

Planorbis (Gyraulus) borealis Lovén.

1871. *Planorbis rossmaessleri* WESTERLUND, *Exposé critique Mollusques terr. eau douce Suède et Norvège*, l'psal, p. 134 [non *Planorbis Rossmaessleri* AUERSWALD].¹
1873. *Planorbis rossmaessleri* WESTERLUND, *Fauna Molluscorum Sueciae, Norveg. et Daniae*, p. 395.
1875. *Planorbis borealis* LOVÉN, in : WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 112, No. 16, taf. ii, fig. 23 à 25.
1877. *Planorbis (Gyraulus) borealis* WESTERLUND, *Sibiriens Land-och Sötvatten-Mollusker*, p. 50, No. 5.
1885. *Planorbis borealis* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, p. 80, No. 33.
1886. *Planorbis borealis* CLESSIN, *Die Familie der Linnæiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 102, No. 65, taf. xix, fig. a.
1909. *Planorbis (Gyraulus) hirsutus* var. *borealis* DALL, *Land and Fresh water Mollusks of Alaska*, p. 93.
1918. *Planorbis hirsutus borealis* BRYANT WALKER, *Synopsis. Fresh Water Mollusca North America*, *University of Michigan. Miscellaneous Publications* No. 6, Michigan, p. 100.

LOCALITÉ :

Sibérie : Lac Pundra, par 67° de latitude nord ; No. 117B ; 2 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce habite seulement les régions boréales : la Norvège [C. A. WESTERLUND], la Suède [E. HEMBERG, V. LILLJEBORG, LOVÉN, A. W. MALM], la Finlande [DR. C. DE WALLENBERG, A. LUTHER], la Laponie [A. E. NORDENSKIÖLD et A. E. NYLANDER], la Sibérie [C. A. WESTERLUND], l'Alaska [W. H. DALL].

Coquille de petite taille, subconvexe en dessus avec une région centrale ombiliquée, concave et profondément ombiliquée en dessous ; spire composée de 5 tours convexes à croissance rapide mais assez régulière ; dernier tour grand, subcylindrique, à peu près aussi convexe en dessus qu'en dessous, légèrement anguleux à sa périphérie et un peu dilaté à son extrémité ; sutures bien marquées ; ouverture oblique, subovale, à bords convergents réunis par une mince callosité blanche.

Diamètre maximum . 7—7½ millimètres ; diamètre minimum : 6½—7 millimètres ; hauteur maximum : 2—2½ millimètres, diamètre de l'ouverture 2½ millimètres ; hauteur de l'ouverture : 2½ millimètres.

¹ AUERSWALD in : SCHMIDT, *Zeitschrift für Malakozoolog.*, 1851, p. 179 et in : ROSSMÄSSLER, *Iconographie der Land-und Süßwasser-Mollusk.*, XVIII, 1859, p. 131, fig. 962 : = CLESSIN *Deutsche Excursions-Mollusken-Fauna*, 1877, p. 416, fig. 271 ; = WESTERLUND, *Malakoz. Blätter*, XXII, 1875, p. 111, No. 14 [= *Planorbis albus* NORDENSKIÖLD et NYLANDER, *Finnlands Mollusker*, 1856, p. 66, No. 7 ; = *Planorbis albus* WALLENBERG, *De Molluscis Lapponiae Luensis* (Dissert. inaug., Berol., 1858), p. 32 ; et Luleå Lapplands Moll., in : *Malakozoolog. Blätter*, V, 1858, p. 114]. Ce *Planorbis Rossmaessleri* Auerswald appartient également au sous-genre *Gyraulus*. C'est une coquille de petite taille (diamètre maximum : 5 à 6 millimètres), au test luisant d'un corne jaunâtre très finement strié, composée de 4 tours de spire à croissance rapide, le dernier très grand avec une ouverture subarrondie et un peu oblique. Ce *Planorbis* habite l'Allemagne et la Bohême.

Test mince, très fragile, subtransparent, assez brillant, corné brun ou rougeâtre, orné de stries longitudinales irrégulières, serrées, obliquement incurvées, coupées de stries spirales très fines, serrées et subrégulières. Les stries longitudinales sont plus accentuées en dessus qu'en dessous tandis que les stries spirales sont mieux marquées en dessous, principalement au dernier tour.

Ces exemplaires du Musée de Calcutta, dont je viens de donner la description, diffèrent légèrement du type tel qu'il a été figuré par C. A. WESTERLUND, notamment par leur dernier tour mieux dilaté à son extrémité. Ils sont, de plus, de taille sensiblement plus petite, les échantillons typiques mesurant 8 à 8½ millimètres de diamètre maximum pour 2¾ millimètres de hauteur maximum.

W. H. DALL rapporte cette espèce au *Planorbis* (*Gyraulus*) *hirsutus* Gould¹ dont il fait une simple variété qui, dit-il. "is merely a somewhat delicately sculptured mutation"² D'ailleurs W. H. DALL ajoute que le *Planorbis* (*Gyraulus*) *hirsutus* Gould³—qui se distingue très difficilement d'une autre espèce ayant, en Amérique, la même répartition géographique, le *Planorbis* (*Gyraulus*) *defectus* Say⁴—est lui-même identique au *Planorbis* (*Gyraulus*) *albus* Müller d'Europe et que "the differences which have been reported to exist between the New England and the European shell are due to the comparison being made between discrepant varieties. If a series including all varieties from many different localities in Europe, be compared with a similar American series, parallels for each variation will be found"⁵ Je pense que cette manière de voir est un peu excessive et je crois qu'il faut considérer le *Planorbis* (*Gyraulus*) *hirsutus* Say comme l'espèce représentative, en Amérique, du *Planorbis* (*Gyraulus*) *albus* Müller de l'Europe.

Planorbis (*Gyraulus*) *agraulus* Bourguignat.

1864. *Planorbis agraulus* BOURGUIGNAT, *Malacologie Algérie*, II, Paris, p. 159, pl. x, fig. 22 à 25.
 1885. *Planorbis agraulus* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 78, No. 25.
 1886. *Planorbis agraulus* CLESSIN, *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 124, No. 93, taf. xx, fig. 1.
 1887. *Planorbis agraulus* LETOURNEUX et BOURGUIGNAT, *Prodrome Malacologie terr. fluviat. Tunisie*, Paris, p. 134.

¹ GOULD (A. A.), *American Journal of Sciences*, XXXVIII, 1840, p. 196; et: *Report on the Invertebrata of Massachusetts, comprising the Mollusca, Annelida and Radiata*, Cambridge, 1840, p. 206, pl. xi, fig. 135.

² DALL (W. H.), *Land and Fresh water Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New-York, 1905, p. 93 et p. 94.

³ Cette espèce vit seulement au Canada et, aux États-Unis, dans les régions situées au nord et à l'est du Mississipi.

⁴ SAY (TH.), *Narrative of an Expedition to the Source of the St. Peter's River, etc...*, under the Command of Major STEPHEN H. LONG, II, Appendix, 1824, p. 261, pl. xv, fig. 8.

⁵ DALL (W. H.), *loc. supra cit*, 1905, p. 94.

LOCALITÉ :

Algérie : Environs d'Oran.

DISTRIBUTION GÉOGRAPHIQUE.

Primitivement découvert en Algérie [J. R. BOURGUIGNAT, *loc. supra cit.*, 1864, p. 159] ce *Planorbe* vit également en Tunisie [A. LETOURNEUX et J. R. BOURGUIGNAT, *loc. supra cit.*, 1887, p. 134]. D'après C. A. WESTERLUND [*loc. supra cit.*, V, 1885, p. 78] il habiterait également les eaux douces de la Sicile et de la Sardaigne.

Le *Planorbis* (*Gyraulus*) *agraulus* Bourguignat est très voisin d'une autre espèce, vivant également en Algérie et en Tunisie, le *Planorbis* (*Gyraulus*) *numidicus* Bourguignat.¹ Ou l'en séparera : à sa spire à croissance plus lente ; à son dernier tour proportionnellement plus grand, mieux dilaté et bien plus descendant à son extrémité ; enfin à son ouverture moins oblique avec un bord supérieur moins convexe.

Planorbis (*Gyraulus*) *glaber* Jeffreys.

- 1830. *Planorbis glaber* JEFFREYS, *Transactions Linnean Society of London*, XVI, p. 285.
- 1837. *Planorbis laevis* ALDER, *Catal. suppl. Newcastle, Transact. Newc.*, II, p. 537.
- 1844. *Planorbis regularis* HARTMANN, *Erd-und Süßwasser-Gasterop. d. Schweiz*, p. 97, taf. xxviii.
- 1848. *Planorbis Moquini* REQUIEN, *Catalogue Mollusques Corse*, p. 50.
- 1850. *Planorbis cupaeccola* GÄLLENSTEIN, *Kärnth. Land-und Süßwasser-Gasterop.*, p. 181.
- 1855. *Planorbis laevis* MOQUIN-TANDON, *Histoire Mollusques terr. fluvial. France*, II, Paris, p. 442, pl. xxxi, fig. 20 à 23.
- 1875. *Planorbis glaber* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 113, No. 10, taf. IV, fig. 22 à 24.
- 1878. *Planorbis glaber* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. ii, fig. 10a—10b.
- 1878. *Planorbis laevis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 245, No. 40.
- 1882. *Planorbis laevis* LOCARD, *Prodrome, Catalogue Mollusques terr. fluv. France*, Lyon et Paris, p. 192.
- 1885. *Planorbis glaber* WESTERLUND, *Fauna der paläarct. region Binnenschnecken*, V, p. 81, No. 36.
- 1886. *Planorbis glaber* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 100, No. 63, taf. xix, fig. 6 et taf. xiii, fig. 32 à 35.
- 1893. *Planorbis laevis* LOCARD, *Coquilles fluviatiles France*, Lyon et Paris, p. 61.
- 1913. *Planorbis* (*Gyraulus*) *glaber* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 257, fig. 306.

¹ BOURGUIGNAT (J. R.), *Malacologie terr. et fluvial. de l'Algérie*, II, Paris, 864, p. 160, pl. x, fig. 26 à 29.

LOCALITÉ :

Angleterre : Birmingham, dans le Sutton Park.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce vit dans toute l'Europe y compris, au nord, la Suède et la Norvège [C. A. WESTERLUND¹], l'Islande [H. SCHLESCH²], la Finlande [A. LUTHER³] et, au sud, l'Espagne [DR. G. SERVAIN⁴], le Portugal [A. LOCARD⁵] et même l'île de Madère.⁷ En Afrique, ce *Planorbis* vit en Algérie [J. R. BOURGUIGNAT⁸] mais semble manquer aussi bien au Maroc qu'en Tunisie. Son aire d'extension est beaucoup plus grande en Asie : on le retrouve, en effet, d'une part jusqu'au sud de la mer Caspienne [O. BOETTGER⁹], dans tout le Turkestan et le Yarkand [A. FEDTSCHENKO,¹⁰ G. NEVILL¹¹, DR. E. MARTENS¹²]; d'autre part dans toute la Sibérie occidentale [C. A. WESTERLUND¹³].

En Algérie—et même en Corse¹⁴—le *Planorbis* (*Gyraulus*) *glaber* Jeffreys est remplacé partiellement par une espèce très voisine, le *Planorbis* (*Gyraulus*) *Brondeli* Raymond¹⁵ qui s'en dis-

¹ WESTERLUND (C. A.), *Exposé critique Mollusques terr. eau douce Suède et Norvège* Upsal, 1871, p. 136.

² SCHLESCH (H.), Notes on *Planorbis* and *Margaritana* in Iceland, *The Naturalist*, Juin 1917, p. 201.

³ LUTHER (A.), Bidrag till Kännedomen Iand- och Sötvattengastropodernas utbredning i Finland, *Acta Societatis pro Fauna et Flora Fennica*, XX, No. 3, Helsingfors, 1901, p. 106.

⁴ SERVAIN (DR. G.), *Etude sur les Mollusques recueillis en Espagne et en Portugal*, St. Germain, Août 1880, p. 141.

⁵ LOCARD (A.), Conchyliologie portugaise. Les Coquilles terr. eaux douces et saumâtres; *Archives Muséum Hist. natur.* Lyon, VII, 1899, p. 182.

⁶ Le *Planorbis* (*Gyraulus*) *glaber* Jeffreys, toujours peu répandu, semble encore plus rare dans les régions oriento-méridionales de l'Europe. S'il est connu en Corse et en Italie, il n'a, jusqu'ici, jamais été signalé ni en Grèce, ni en Serbie, ni en Roumanie, ni au Monténégro, ni en Albanie.

⁷ Où il a été signalé par LOWE [*Annals and Magazine of Natural History*, London, Juillet 1860]; = BARON DE C. DE PAIVA, *Monographia Molluscorum terrestrium, fluviatilium, lacustrum insularum Maderensium*, Lisboa, 1867, p. 149; = R. B. WATSON, Note sur les coquilles terr. communes à Madère et à d'autres contrées, *Journal de Conchyliologie*, XXIV, 1876, p. 224; = et T. V. WOLLASTON, *Testacea Atlantica, or the Land and Freshwater Shells of the Azores, Madeiras, etc.* . . . London, 1878, p. 273 et p. 380. Une espèce représentative, d'ailleurs très voisine, vit aux îles Canaries, notamment à Ténériffe, où elle fut découverte par REISS. A. MOUSSON en a donné la description, dans sa *Révision de la Faune Malacologique des Canaries* (Paris, 1872, p. 140) sous le nom de *Planorbis* Reissi.

⁸ BOURGUIGNAT (J. R.), *Malacologie terr. fluvi. Algérie*, Paris, II, 1864, p. 157.

⁹ BOETTGER (DR. O.) *Mollusca*, in: RADDE (DR. G.), *Die Fauna und Flora des Südwestlichen Caspi Gabeltes*, Leipzig, 1886, p. 325.

¹⁰ FEDTSCHENKO (A.), *Reisen in Turkestan*, Mollusken [par le Dr. E. von MARTENS], p. 29.

¹¹ NEVILL (G.), *Scientific Results of the Second Yarkand Mission*, Mollusca, Calcutta, 1878 p. 10.

¹² MARTENS (DR. E. von), Ueber Centralasiatische Mollusken, *Mémoires Académie Sciences Saint-Petersbourg*, XXX, No. 11, 1882, p. 42.

¹³ WESTERLUND (C. A.), *Sibiriens Land- och Sötvatten-Mollusker*, Stockholm, 1877, p. 108.

¹⁴ Cf.: CAZIOT (Commandant), Etude sur la faune des Mollusques vivants terr. et fluviat. de l'île de Corse, *Bulletin soc. sciences histor. et natur. Corse*; 266^e à 269^e fasc. (Janvier-Avril), XXII, Bastia, 1903, p. 262 et 263.

¹⁵ RAYMOND, Description Coquilles nouv. Nord Afrique, *Journal de Conchylio-*

tingue surtout par son ouverture subarrondie et son test très finement strié¹.

Planorbis (Gyraulus) Draparnaudi Jeffreys.

1830. *Planorbis Draparnaudi* JEFFREYS, *Transactions Linnean Society of London*, XVI, p. 386.
 1864. *Planorbis Draparnaldi* MÖRCH, *Synopsis Molluscor. Dan.*, p. 53.
 1865. *Planorbis Draparnaldi* WESTERLUND, *Sveriges Land- och Sötvatt.-Mollusk.*, p. 105.
 1871. *Planorbis Draparnaldi* WESTERLUND, *Exposé critique Mollusques terr. eau douce Suède et Norvège*, Upsal, p. 132.
 1873. *Planorbis Draparnaldi* WESTERLUND, *Fauna Molluscor. Suec., Norveg. et Daniae*, p. 393.
 1875. *Planorbis albus* variété 3 *draparnaldi* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 111, taf. iv, fig. 10 à 12.
 1885. *Planorbis draparnaldi* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 81, No. 38.
 1886. *Planorbis albus* var. 4 *Draparnaldi* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 97.
 1893. *Planorbis Draparnaudi* LOCARD, *Coquilles fluviatiles France*, Lyon et Paris, p. 61.
 1913. *Planorbis (Gyraulus) Draparnaudi* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 257.

LOCALITÉ :

Angleterre : Manchester ; deux exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce habite principalement l'Europe septentrionale : Suède, Norvège, Danemark, Finlande [H. FRIELE, A. LUTHER²] où elle s'avance jusqu'au 63° de latitude nord environ. Elle vit aussi, mais plus rarement, en Allemagne, en Angleterre et en France, notamment dans les régions du nord et de l'est.

Les exemplaires du Musée d'Histoire naturelle de Calcutta qui m'ont été soumis atteignent jusqu'à 6¼ et 6½ millimètres de diamètre maximum (le type *Draparnaudi* a de 5 à 6 millimètres de diamètre maximum). Ils sont presque plans eu dessus, leur sculpture est typique, mais leur dernier tour est assez dilaté à l'extrémité, un peu à la façon du *Planorbis (Gyraulus) albus* Müller. D'ailleurs les deux espèces sont certainement voisines, mais le *Planorbis (Gyraulus) Draparnaudi* Jeffreys est surtout apparenté au *Planorbis (Gyraulus) glaber* Jeffreys dont il se distingue par sa taille plus grande, sa coquille plane en dessus et concave en dessous,³ son dernier tour plus dilaté à l'extrémité et son ouverture plus nettement arrondie.

logie, IV, 1853, p. 82 (*Planorbis Brøndelii*) ; = BOURGUIGNAT (J. R.), *Malacologie terr. fluviat. Algérie*, II, Paris, 1864, p. 161, pl. x, fig. 30 à 33c.

¹ Le test est presque lisse chez le *Planorbis (Gyraulus) glaber* Jeffreys.

² LUTHER (A.), *Bidrag till Kännedomen Land- och Sötvattengastropodernas utbr. i Finland*, *Acta Societatis pro Fauna et Flora Fennica*, XX, No. 3, Helsingfors, 1901, p. 105.

³ Le *Planorbis (Gyraulus) glaber* Jeffreys a une coquille concave en dessus et en dessous.

Planorbis (Gyraulus) albopersicus Germain.

Pl. IV, fig. 5, 6 et 9.

1878. *Planorbis albus* NEVILL, *Hand List Mollusca Indian Museum Calcutta*, I, p. 245, No. 39 (*part* :—exemplaires de Perse seulement) [non : *Planorbis albus* MÜLLER].
1918. *Planorbis (Gyraulus) albopersicus* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XXIV, No. 4, p. 277.

LOCALITÉS :

Perse : Kalagan ; = Dizak ; nombreux exemplaires.

Coquille déprimée,¹ un peu convexe en dessus avec une partie centrale étroite et assez enfoncée, largement ombiliquée en dessous ; spire composée de 4 tours convexes à croissance d'abord lente et régulière, puis plus rapide,² séparés par des sutures profondes ; dernier tour grand, subarrondi à pen près aussi convexe en dessous qu'en dessus, sauf à la partie terminale où il est plus convexe en dessous qu'en dessus, dilaté et souvent subdescendant à l'extrémité, avec une *indication carénale inframédiane* plus ou moins accentuée suivant les échantillons ; ouverture oblique, ovale transverse, à bords convergents assez rapprochés réunis par une callosité blanche bien marquée.

Diamètre maximum : 6 millimètres ; diamètre minimum : 4½ millimètres, hauteur maximum : 1½ à 1½ millimètre.

Test assez mince, un peu subtransparent, corné clair ou gris verdâtre ; stries longitudinales fines, subonduleuses, fortement obliques, subégales et serrées, plus fines et plus régulières en dessous où elles sont visibles même sur les premiers tours. Il n'y a pas de sculpture spirale.

Le *Planorbis (Gyraulus) albopersicus* Germain est assez variable : le dernier tour est parfois bien descendant à l'extrémité avec une indication carénale mieux accentuée, l'ombilic peut être plus étroit, enfin le test est, chez certains individus, plus mince, plus léger, de coloration plus claire, rarement même hyalin, garni d'une sculpture un peu plus délicate.

Ce *Planorbe* est une espèce représentative du *Planorbis (Gyraulus) albus* Müller³ des eaux douces européennes ; il s'en distingue nettement par son enroulement plus lent, les caractères de son dernier tour et de son ouverture et son test dépourvu de toute sculpture spirale.

Planorbis (Gyraulus) pankongensis Nevill.

1878. *Planorbis albus (part)* NEVILL, *Hand List Mollusca Indian Museum Calcutta*, I, p. 245, No. 39 (exemplaires du lac Pankong seulement).

¹ Vue de profil, la coquille a un aspect tectiforme.

² La croissance des tours de spire est plus rapide en dessous qu'en dessus.

³ V. ante, p. 99, de ce Mémoire.

- 1878 *Planorbis albus*, variété, NEVILL, *Second Yarkand Mission, Mollusca*, Calcutta, p. 10.
 1882. *Planorbis Pankongensis*. NEVILL mss, in : MARTENS, *Ueber Centralas. Mollusken, Mémoires Académie Sciences Saint-Petersbourg*, VII^e série, XXX, No. 11, p. 45, taf. iv, fig. 14a-14b et 14c.
 1890. *Planorbis (Gyraulus) pankongensis* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, suppl. I, p. 149, No. 28c.
 1918. *Planorbis (Gyraulus) pankongensis* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XXIV, No. 4, p. 280.

LOCALITÉ :

Asie : Lac Pankong [=Pangkong], dans le Tibet occidental ; très nombreux exemplaires [Collect. Doct. F. STOLICZKA ; Collect. G. NEVILL.] ; No. M. $\frac{4090}{1}$; = Cachemire (Kashmir), sans indication précise de localité ; quelques exemplaires.

Coquille déprimée, subconvexe en dessus avec une région centrale assez étroite, profondément ombiliquée en dessous ; spire composée de 3—3½—plus rarement 4—tours convexes à croissance rapide séparés par de profondes sutures, dernier tour très grand, à peu près aussi convexe en dessus qu'en dessous, ni caréné, ni anguleux, bien dilaté et parfois plus ou moins descendant à l'extrémité ; ouverture oblique, subpyriforme arrondie, à bords convergents et rapprochés réunis par une callosité blanche. *péristome intérieurement bordé d'un épaississement blanc très nettement marqué.*

Diamètre maximum : 6 millimètres ; diamètre minimum : 4½ millimètres ; hauteur maximum : 2 millimètres ; hauteur de l'ouverture : 2 millimètres ; diamètre de l'ouverture : 2½ millimètres.¹

Test assez solide mais peu épais, corné blond ou jaunâtre, à peine subtransparent, avec, en dessus et en dessous, des stries longitudinales médiocres, serrées, très obliquement onduleuses, inégales et inégulières, à peine plus fines en dessous. Il n'y a pas de sculpture spirale.

Ce Planorbe montre un certain polymorphisme. L'allure du dernier tour est, notamment, fort variable : chez beaucoup d'exemplaires il est plus ou moins descendant à l'extrémité ; cette tendance s'exagère chez quelques individus qui sont franchement subscalaires : l'ouverture est alors entièrement détachée, arrondiet avec un péristome continu comme celui des Valvées. Le test es, quelquefois absolument transparent et d'un corné très clair ou légèrement jaunâtre ; d'autres fois il est marron ou chocolat clair. Enfin quelques spécimens montrent des traces de sculpture spirale

Le DR. E. von MARTENS a donné une exacte figuration du *Planorbis (Gyraulus) pankongensis* Nevill. Cependant il représente

¹ Ces dimensions correspondent aux grands individus. Le DR. E. von MARTENS (*loc. supra cit.*, 1882, p. 45) donne seulement : diamètre maximum : 4 millimètres ; diamètre minimum : 3 millimètres ; hauteur : 1½ millimètre ; hauteur de l'ouverture : 1½ millimètre ; diamètre de l'ouverture : 2½ millimètres.

le dernier tour trop brusquement dilaté à son extrémité (fig. 14c, taf. iv, loc. *supra cit.*, 1882); par contre les deux autres figures sont très fidèles, notamment la figure 14a qui rend bien le profil de ce Planorbe, la forme de son ouverture et l'épaississement interne du péristome. Mais le DR. E. von MARTENS est évidemment dans l'erreur quand il rapproche le *Planorbis* (*Gyraulus*) *pankongensis* Nevill des *Planorbis andecolus* d'Orbigny¹ de l'Amérique du Sud et *Planorbis choanomphalus* Martens² de l'Afrique orientale (Lac Oukéréwé).

G. NEVILL fait remarquer, avec raison, que par son ombilic étroit ce Planorbe se rapproche de certaines formes du *Planorbis* (*Gyraulus*) *convexiusculus* Hutton de l'Inde.³ Il est cependant, par sa forme générale et son enroulement, plus étroitement apparenté aux *Gyraulus* de la faune européenne dont il se distingue, en dehors de son ombilic étroit, par les caractères si particuliers de son ouverture et par l'absence de sculpture spirale. Il est certainement encore plus voisin du *Planorbis* (*Gyraulus*) *ladacensis* Nevill, mais cette dernière espèce possède une spire plus régulièrement enroulée, un dernier tour proportionnellement plus petit et un ombilic plus large se rapprochant davantage de celui du *Planorbis* (*Gyraulus*) *albus* Müller.

Planorbis (*Gyraulus*) *ladacensis* Nevill.

- 1878 *Planorbis albus* (part) NEVILL, *Hand List Mollusca Indian Museum Calcutta*, I, p. 245, No 39 (exemplaires du Yarkand seulement) [non. MÜLLER]
- 1878 *Planorbis laevis*, variété, NEVILL, loc. *supra cit.*, p. 245, No 40 [non ALDER]
- 1878. *Planorbis* (*Gyraulus*) *laevis* variété *Ladacensis* NEVILL, *Second Yarkand Mission, Calcutta*, p. 10, No 21
- 1878. *Planorbis* (*Gyraulus*) *laevis* NEVILL (forme du Yarkand), loc. *supra cit.*, p. 10
- 1882 *Planorbis* Nevilli MARTENS, *Ueber Centralas Mollusken, Mémoires Académie sciences Saint-Petersbourg*, VII^e série, xxx, No. 11, p. 45.
- 1890 *Planorbis* (*Gyraulus*) Nevilli WESTERLUND, *Fauna der palaurci region Binnenconchylien*, Suppl. I, p. 149, No. 36a.
- 1918 *Planorbis* (*Gyraulus*) *ladacensis* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XXIV, No. 4, p. 278

LOCALITÉS :

Asie : Leh, région de Ladak (Tibet) [Dr. F. STOLICZKA] ; nombreux exemplaires ; = 5 miles à l'ouest de Panja [= Panjah], Badakshan [Dr. F. STOLICZKA] ; 10 exemplaires ; = Yarkand

¹ ORBIGNY (A. d'), *Synopsis terr. et fluviat. Molluscorum... Americam meridion.*, *Magasin de Zoologie de GUÉRIN MENEVILLE*, 1835, p. 26, No. 2.

² MARTENS (DR. E. von), *Recente Conchylien aus dem Victoria Nyanza* (Ukerewe), *Sitzungsb. d. Gesellschaft Naturforsch. Freunde Berlin*, Juillet 1879, p. 148 ; et : *Beschalte Weichthiere Deutsch-Ost-Afrik.*, Berlin, 1897, p. 148, taf. vi, fig. 14-15.

³ NEVILL (G.), *Scientific Results of the Second Yarkand Mission, Mollusca*, Calcutta, 1878, p. 10.

(Turkestan oriental) [DR. F. STOLICZKA]; nombreux exemplaires ; No. 28 B.¹

Coquille déprimée, à peu près plate en dessus² et en dessous, assez largement et peu profondément ombiliquée; spire composée de $4\frac{1}{2}$ tours convexes à croissance assez lente, presque régulière, séparés par des sutures profondes; dernier tour médiocre, aussi convexe dessus que dessous, arrondi, non anguleux, mais légèrement comprimé en son milieu vers son extrémité qui est un peu dilatée; ouverture peu oblique, ovulaire-transverse, à bords convergents assez éloignés, le bord supérieur dépassant un peu le bord columellaire.

Diamètre maximum : 6 millimètres; diamètre minimum : 5 millimètres; hauteur : $1\frac{1}{2}$ millimètre; diamètre de l'ouverture : $2\frac{1}{4}$ millimètres; hauteur de l'ouverture : 2 millimètres.

Test assez solide, à peine subtransparent, d'un corné fauve rougeâtre, presque rouge au dernier tour, assez brillant; stries longitudinales obliques, onduleuses, assez fortes. subégales et serrées, plus fines en dessous qu'en dessus. Il n'y a pas trace de sculpture spirale.

Cette description est faite d'après l'échantillon type [de Leh] appartenant au Musée d'Histoire naturelle de Calcutta, sur lequel G. NEVILL a établi sa variété *ladacensis*.

Les autres spécimens provenant de la même localité correspondent à cette description, mais ils présentent quelque polymorphisme. La taille est souvent plus petite, oscillant entre 4 et 6 millimètres de diamètre maximum; la sculpture est plus ou moins accentuée; enfin la coloration est parfois plus claire, parfois aussi plus vive, presque rouge, constituant une mutation excolore *rubra* assez nette.

Les individus recueillis au Yarkand par le DR. F. STOLICZKA sont de taille un peu plus faible, les grands spécimens ne dépassant pas 5 millimètres et la très grande majorité des individus ayant seulement de 4 à $4\frac{1}{2}$ (parfois même $3\frac{1}{2}$) millimètres de diamètre maximum. Les autres caractères ne diffèrent pas, sauf la coloration: ici le test est généralement d'un corné clair le plus souvent recouvert d'un épiderme brun foncé ou noir et l'intérieur de l'ouverture est d'un bleu brillant. Le DR. E. von MARTENS désigne cette forme sous le nom de *Planorbis Nevilli B Yarkandensis*.³ D'ailleurs, cet auteur distingue deux variétés du Planorbe qui nous occupe (qu'il appelle *Planorbis Nevilli* Martens):

A. *Ladacensis* (= *Planorbis laevis* var. *ladacensis* Nevill).

B. *Yarkandensis* (= *Planorbis albus*, Yarkand form, Nevill).

¹ Cette espèce n'a pas encore été recueillie en dehors de ces localités.

² En dessus, la partie centrale concave est étroite et peu profonde.

³ MARTENS (DR. E. von), Ueber Centralasiatische Mollusken, *Mémoires Académie Sciences Saint-Petersbourg*, VII^e série, xxx, 1882, p. 45.

Nous venons de voir que la variété *yarkandensis* Martens n'est qu'une forme *minor*, moins brillamment colorée et généralement recouverte d'un enduit noir, du *Planorbis ladacensis* Nevill. Il était donc inutile de créer un nom nouveau pour désigner cette espèce : en bonne justice j'ai rétabli celui de *Planorbis ladacensis* pour ce *Gyraulus* à enroulement lent et dépourvu de toute sculpture spirale.

E. von MARTENS¹ compare ce Planorbe au *Planorbis* (*Gyraulus*) *borealis* Lovén.² Le rapprochement est, en effet, exact : la forme générale est à peu près la même, mais le *Planorbis borealis* Lovén est de taille plus forte (8 à 8½ millimètres de diamètre maximum), sa spire comprend 5 tours et son test est orné d'une sculpture spirale très nette.³

§ II.

Planorbis (*Gyraulus*) *hebraicensis* Bourguignat.

- 1852. *Planorbis Hebraicus* BOURGUIGNAT, *Testacea noviss. quae SAULCY Orient*, p. 23, No. 3.
- 1853. *Planorbis Hebraicus* BOURGUIGNAT, *Catalogue Mollusques SAULCY Orient*, p. 57, pl. ii, fig. 38 à 40.
- 1874. *Planorbis hebraicus* MARTENS, *Vorderasiatische Conchylien*, Cassel, p. 64.
- 1877. *Gyraulus hebraicus* KOBELT, *Jahrb. d. deutschen Malakozoolog. Gesellsch.*, Frankfurt a-M., IV, p. 36.
- 1885. *Planorbis* (*Gyraulus*) *hebraicus* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, p. 79, No. 28.
- 1886. *Planorbis hebraicus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 125, No. 94, taf. xviii, fig. 8.
- 1912. *Planorbis* (*Gyraulus*) *hebraicus* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XVIII, p. 450, No. 264.

LOCALITÉ :

Palestine : sans indication précise de localité [*Naturhistorisches Institut*, Frankfurt a-M.] ; un exemplaire ; No. M. ⁴⁰⁹⁹/₁.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est spéciale à la Syrie et à la Palestine. Elle est parfois assez répandue, notamment dans les mares et canaux de la région verdoyante de Damas [HENRI GADEAU DE KERVILLE].

Le specimen appartenant au Musée d'Histoire naturelle de Calcutta est de taille assez grande. puisqu'il mesure : 5½ millimètres de diamètre maximum ; * 4½ millimètres de diamètre minimum et 2 millimètres de hauteur (diamètre de l'ouverture : ⁶ 2½

¹ MARTENS (DR. E. von), Ueber Centralasiatische Mollusken, *Mémoire Académie Sciences Saint-Petersbourg* VII^e série, xxx, 1882, p. 45.

² LOVÉN, in : WESTERLUND (C. A.), *Malakologische Studien, Kritiken und Notizen*, *Malakozoolog. Blätter*, XXII, 1875, p. 112, No. 16, taf. ii, fig. 23-25.

³ "... Testa... subtiliter transversim striata, minutissima et dense spirali ter lineata..." [C. A. WESTERLUND, *loc. supra cit.* XXII, 1875, p. 112].

⁴ Cette espèce atteint jusqu'à 7 millimètres de diamètre maximum

⁵ L'ouverture est très obliquement ovulaire transverse.

millimètres; hauteur de l'ouverture: $2\frac{1}{2}$ millimètres). Son test est transparent, d'un corné très pâle garni, en dessus, de fines stries longitudinales obliques, inégales et assez serrées et, en dessous, de stries plus fines, plus régulières et notablement plus serrées.

Planorbis (Gyraulus) piscinarum Bourguignat.

- 1852. *Planorbis piscinarum* BOURGUIGNAT, *Testacea novissima quae SAULCY Orient*, p. 22, No. 2.
- 1853. *Planorbis piscinarum* BOURGUIGNAT, *Catalogue Mollusques SAULCY Orient*, p. 56, pl. ii, fig. 32—34.
- 1874. *Planorbis piscinarum* MARTENS, *Vorderasiatische Conchylien*, Cassel, p. 64.
- 1877. *Planorbis piscinarum* KOBELT, *Jahrb. d. deutschen Malakozoolog. Gesellschaft*, Frankfurt a-M., IV, p. 36.
- 1885. *Planorbis (Gyraulus) piscinarum* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 78, No. 27.
- 1886. *Planorbis piscinarum* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 190, No. 184, taf. xxix, fig. 4.
- 1912. *Planorbis (Gyraulus) piscinarum* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, XVIII, p. 450, No. 262.

LOCALITÉ :

Syrie : Damas ; deux exemplaires ; No. P. 118 B.

DISTRIBUTION GÉOGRAPHIQUE.

Primitivement découverte en Syrie par F. DE SAULCY,¹ cette espèce a été retrouvée depuis en Anatolie et même, dans l'Europe Orientale, en Bulgarie [O. WOHLBEREDT].²

Le *Planorbis (Gyraulus) piscinarum* Bourguignat est une coquille mesurant de 3 à 5 millimètres de diamètre maximum.

Une variété *minima* Bourguignat³ n'a que 3 millimètres de diamètre sur $1\frac{3}{4}$ millimètre de hauteur maximum. Elle a été recueillie à Damas (Syrie) par F. DE SAULCY et, plus récemment, dans les marécages de Damas (vers 690 mètres d'altitude) et dans la mare d'Addous, aux environs de Baalbeck (1100 mètres d'altitude environ) par HENRI GADEAU DE KERVILLE. Ce savant et habile naturaliste a également trouvé, dans la région verdoyante de Damas, une grande variété (elle atteint $5\frac{1}{2}$ millimètres de diamètre maximum) dont le test, corné clair, est orné de stries longitudinales serrées, très obliquement onduleuses dont les plus nombreuses sont médiocres; mais, d'espace en espace, et sans

¹ Cf. : J. R. BOURGUIGNAT, *Testacea novissima quae CL. DE SAULCY in itinere per Orientem annis 1850 et 1851*, Paris, 1853, p. 23, et : *Catalogue raisonné Mollusques terr. et fluviat. recueillis F. DE SAULCY pendant son voyage en Orient*, Paris, 1853, p. 56—57.

² WOHLBEREDT (O.), *Zur Molluskenfauna von Bulgarien*, *Abhandlungen der Naturforsch. Gesellsch. in Götting*, XXVII, 1911, p. 52.

³ BOURGUIGNAT (J. R.), *loc. supra cit.*, 1852, p. 23; et *loc. supra cit.*, 1853, p. 57.

régularité, on observe des stries beaucoup plus fortes ayant presque l'aspect de petites côtes. J'ai donné, à ce Planorbe, le nom de *Planorbis (Gyraulus) piscinarum* variété *heterocosta* Germain.¹

Les individus typiques ont un test mince, fragile, plus ou moins transparent, d'un corné clair uniforme, garni de stries fines, délicates, irrégulières, très obliques et un peu moins accentuées en dessous qu'en dessus.

§ III.

Planorbis (Gyraulus) Schweinfurthi Clessin.

1886. *Planorbis Schweinfurthi* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 213, No. 220, taf. xxxii, fig. 8 [non : *Planorbis Schweinfurthi* Innes²].

LOCALITÉ :

Afrique septentrionale : Oasis dans le Sahara [S. CLESSIN]; 3 exemplaires, No. 118 B.

Cette espèce, connue seulement de la localité originale signalée par S. CLESSIN, est une très petite coquille subconvexe en dessus, concave en dessous, dont la spire possède 4 tours à croissance assez régulière, le dernier arrondi et médiocrement développé. L'ouverture est obliquement ovale avec les bords marginaux convergents mais assez écartés. Le test est garni de stries longitudinales relativement fortes, serrées et subégales. S. CLESSIN, donne, à ce Planorbe, $3\frac{1}{2}$ millimètres de diamètre maximum et 0,6 millimètre de hauteur. Les exemplaires appartenant au Musée d'Histoire naturelle de Calcutta n'ont que 2 à $2\frac{1}{2}$ millimètres de diamètre maximum.

Planorbis (Gyraulus) abyssinicensis Jickeli.

1870. *Planorbis* nov. sp. BLANFORD, *Geology and Zoology Abyssinia*, p. 473, No. 9.
1872. *Planorbis abyssinicus* JICKELI, *Reisebericht*, p. 43.
1874. *Planorbis abyssinicus* JICKELI, *Fauna der Land-und Süßwasser-Mollusken Nord-Ost-Afrik.*, Dresden, p. 215, taf. vii, fig. 21.

¹ GERMAIN (LOUIS), Mollusques terrestres et fluviatiles de l'Asie Antérieure, 5^e Note : Catalogue des Gastéropodes de la Syrie et de la Palestine, *Bulletin Muséum Hist. natur. Paris*, XVIII, No. 7, Décembre 1912, p. 450 (sans description).

² Le *Planorbis Schweinfurthi* INNES (*Bulletins Société Malacologique France*, I, 1884, p. 340) est synonyme du *Planorbis mareoticus* LETOURNEUX (in : INNES, loc. supra cit., 1884, p. 339), petite espèce carénée très commune dans la Basse Egypte et à laquelle se rattachent, comme synonymes : *Planorbis Ehrenbergi* CLESSIN in MARTINI et CHEMNITZ, loc. supra cit., 1886, p. 201, No. 201, taf. iii, fig. 3 (excl. synonym.) [non : *Planorbis Ehrenbergi* BECK, *Index Molluscorum*, 1837, p. 119, qui est le *Planorbis cornu* EHRENBURG, *Symbolae physicae* No. 2 (non *Planorbis cornu* Brougniart, espèce fossile)]; = *Planorbis Letourneuxi*, INNES, loc. supra cit., 1884, p. 341; = *Planorbis pulchellus* INNES, loc. supra cit. 1884, p. 341; = ? *Planorbis Innesi* BOURGUIGNAT, in : INNES, loc. supra cit., 1884, p. 337 (forma major). L'identité de ce dernier Planorbe est encore un peu douteuse; si elle est démontrée définitivement, le nom de *Planorbis (Gyraulus) Innesi* Bourguignat devra être substitué à celui de *Planorbis (Gyraulus) mareoticus* Letourneux.

1878. *Planorbis* (*Nautilina*) *abyssinicus* NEVILL, *Hand List Mollusca Indian Museum Calcutta*, I, p. 244, No. 31.
 1878. *Planorbis* (*Nautilina*) *natalensis* (?) NEVILL, *loc. supra cit.*, I, p. 244, No. 32 [non : *Planorbis natalensis* KRAUSS].
 1881. *Planorbis abyssinicus* JICKEL, *Jahrb. Deutsch. Malakozoolog. Gesellsch.*, Frankfurt a-M, p. 337.
 1883. *Planorbis abyssinicus* BOURGUIGNAT, *Histoire Malacologique Abyssinie*, Paris, p. 99 et p. 128, et *Annales sciences naturelles, Zoologie*, 6^e série, XV, p. 99 et p. 128.
 1886. *Planorbis abyssinicus* CLESSIN, in *Famille der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 129, No. 101, taf. xxii, fig. 8.
 1898. *Planorbis abyssinicus* POLLONERA, *Bollettino... Musei Anatom. compar.*... Torino, XIII, No. 313, 4 Mars, p. 11.
 1904. *Planorbis abyssinicus* GERMAIN, *Bulletin Muséum Hist. natur. Paris*, X, p. 348, No. 6, p. 353.
 1905. *Planorbis abyssinicus* NEUVILLE et ANTHONY, *Bulletin Muséum Hist. natur. Paris*, XI, No. 3, p. 196 ; XII (1906), No. 5, p. 319 et No. 6, p. 408 et p. 411.
 1906. *Planorbis abyssinicus* NEUVILLE et ANTHONY, *Bulletin Société philomatique Paris*, No. 6, p. 12.
 1908. *Planorbis abyssinicus* NEUVILLE et ANTHONY, *Annales Sciences naturelles Zoologie*, VIII, p. 256.

LOCALITÉ :

Abyssinie: Lac Ashangi [Coll. W. T. BLANFORD]; = Plateau de Wadela [Collect. W. T. BLANFORD].

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe habite toute l'Abyssinie [Abyssinie septentrionale (W. T. BLANFORD), Hamacen [DR. C. JICKEL], Somal (CH. GRAVIER), Abyssinie méridionale¹ (R. ANTHONY, H. NEUVILLE, M. DE ROTHSCILD)]. Au nord de l'Abyssinie, ce Planorbe vit encore dans l'Érythrée italienne [Général DE BOCCARD].

J'ai signalé, dans la rivière d'Andobed (Somal), une variété *Gravieri*² de taille plus petite (3—3½ millimètres de diamètre maximum et 1 millimètre de hauteur) à enroulement plus rapide avec un dernier tour plus dilaté à l'extrémité, une surface inférieure plus profondément ombiliquée et une ouverture mieux arrondie à bords très convergents. Enfin le dernier tour montre une légère carène absolument basale, très visible près de l'ouverture.

Dans son "*Histoire malacologique de l'Abyssinie*"³. J. R. BOURGUIGNAT écrit, en parlant du *Planorbis Herbinii* Bourguignat :

" Je crois qu'il convient de rapporter à cette espèce le *Pla-*

¹ Même à haute altitude, comme à Addis Abeba (2'366 mètres) et au lac sacré du Zyqual (2'814 mètres) [H. NEUVILLE et R. ANTHONY].

² GERMAIN (LOUIS), Sur quelques Mollusques terr. et fluviat. rapportés par M. CH. GRAVIER du désert Somali, *Bulletin Muséum Hist. natur. Paris*, X, 1904, p. 353.

³ Paris, 1883, p. 101.

norbis natalensis (non KRAUSS¹) de W. T. BLANFORD² et de G. NEVILL³ signalé sur le plateau de Wadela.”

Cette assertion est erronée. L'unique exemplaire recueilli par W. T. BLANFORD, nommé *Planorbis natalensis* (Krauss) (?) par G. NEVILL, appartient au Musée d'Histoire naturelle de Calcutta. Bien qu'en très mauvais état,⁴ cette coquille se rapporte, sans contestation possible, au *Planorbis* (*Gyraulus*) *abyssinicensis* Jickeli.

§. IV.

Planorbis (*Gyraulus*) *convexiusculus* Hutton.

- 1849. *Planorbis convexiusculus* HUTTON, *Journal Asiatic Society of Bengal*, XVIII, part ii, p. 657.
- 1876. *Planorbis convexiusculus* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 40, pl. xcix, fig. 8 à 10.
- 1878. *Planorbis convexiusculus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. xi, fig. 93a—93b.
- 1878. *Planorbis* (*Nautilina*) *convexiusculus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 244, No. 35.
- 1886. *Planorbis convexiusculus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 127, No. 98, taf. xvii, fig. 9.
- 1915. *Planorbis* (*Gyraulus*) *convexiusculus* PRESTON, *Fauna of British India : Mollusca* [*Freshwater Gastropoda and Pelecypoda*, London, p. 118, No. 234.
- 1918. *Planorbis saigonensis* (?) ANNANDALE, *Records of the Indian Museum*, Vol. XIV, Calcutta, p. 112, pl. xi, fig. 12 (excl. synonym.).
- 1914. *Planorbis convexiusculus* ANNANDALE, *Records of the Indian Museum*, Vol. XV, Calcutta, p. 166.

LOCALITÉS :

Mésopotamie : Subfossile dans les dépôts des bord de l'Euphrate à Nasariyet et Samara [Doct. N. Annandale]; nombreux exemplaires.

Indes anglaises : Moradabad [ex. coll. *Asiatic Society of Bengal*]; six exemplaires; = Birbhum; sept exemplaires; = Kangra District; huit exemplaires; = Assam [Dr. F. STOLICZKA]; trente exemplaires; = Umbala; dix exemplaires; = Pareshnâth [= Parisnath], Manbhum, Orissa; = Calcutta [Dr. J. BAXTER]; = Chandernagore [Colonel G. B. MAINWARING]; = Port Canning [G. NEVILL].

Iles Andaman : deux exemplaires de petite taille.

Afghanistan : Kandahar; 4 exemplaires.

China : Sanda (Yunnan) [Dr. J. ANDERSON]; = sans indication précise de localité; deux exemplaires.

¹ KRAUSS (F.), *Die Südafrikanischen Mollusken*, Stuttgart, 1848, p. 83, taf. v, fig. 9.

² BLANFORD (W. T.), *Geology and Zoology of the Abyssinia*, London, 1870, p. 473.

³ NEVILL (G.), *Hand list of Mollusca in the Indian Museum Calcutta*, part I, *Gastropoda. Pulmonata and Prosobranchia-Neurobranchia*, Calcutta, 1878, p. 244.

⁴ Cet unique échantillon est, en effet, brisé dans le sens de son diamètre minimum et il lui manque à peu près toute la moitié opposée à l'ouverture.

Subfossile, rives de l'ancien lac He-Ho (province de Yawng-hwe, sur le Shan Plateau, vers 900 mètres d'altitude), [Dr. N. Annandale]; nombreux exemplaires.¹

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis* (*Gyraulus*) *convexiusculus* Hutton vit depuis la Mésopotamie et l'Afghanistan jusqu'en Chine. Il est particulièrement répandu dans l'Inde où il forme souvent des colonies très populeuses dans les étangs, les mares et les ruisseaux.

La coquille du *Planorbis* (*Gyraulus*) *convexiusculus* Hutton possède une spire dont l'enroulement est rapide, surtout en dessous; son dernier tour est grand, bien dilaté à l'extrémité,² arrondi et à peine subcomprimé en haut et en bas³; l'ouverture est ample, très oblique, ovulaire transverse, à bords convergents réunis par une callosité blanchâtre.

G. B. SOWERBY (*in* : L. REEVE, *loc. supra cit.*, 1878, sp. 93) dit que le test de ce Planorbe est lisse : "... Pla... testa... alba, ... laevigata...". En réalité le test, médiocrement transparent, corné jaunâtre clair, est orné de stries fines, serrées, fort obliquement onduleuses, très visibles même sur les premiers tours et un peu plus fines en dessous qu'en dessus. Il n'existe pas de sculpture spirale.

Le Musée d'Histoire naturelle de Calcutta possède quelques beaux exemplaires subscalaires et scalaires de cette espèce. Ils ont une spire qui varie depuis la forme à dernier tour simplement descendant jusqu'à celle presque complètement déroulée.

Planorbis (*Gyraulus*) *saigonensis* Crosse et Fischer.

- 1834. *Planorbis*, No. 12, HUTTON, *Journal Asiatic Society of Bengal* III, p. 91.
- 1834. *Planorbis compressus* HUTTON, *loc. supra cit.*, III, p. 93 [non : MICHAUD].
- 1836. *Planorbis compressus* BENSON, *Journal Asiatic Society of Bengal*, V, p. 743, No. 21.
- 1844. *Planorbis tondanensis* MOUSSON, *Land-und Süßwasser-Mollusken von Java*, p. 44, taf. v, fig. 4 [non : QUOY et GAIMARD].
- 1863. *Planorbis saigonensis* CROSSE et FISCHER, *Journal de Conchyliologie*, XI, p. 362, pl. xiii, fig. 7.
- 1867. *Planorbis compressus* MARTENS, *Malakozoolog. Blätter*, XIV, p. 213.
- 1875. *Planorbis compressus* MORELET, *Séries Conchyliologiques*, IV, *Indo-Chine*, p. 276.

¹ Les plus grands individus ont seulement 5 millimètres de diamètre maximum [N. ANNANDALE, *Aquatic Molluscs of the Inlé Lake and connected waters; Records Indian Museum*, XIV, Calcutta, Août 1918, p. 112].

² Surtout en dessous.

³ Les caractères de ce dernier tour varient dans d'assez larges proportions : il est parfois descendant, l'ouverture n'atteignant pas, en dessus, le plan du dernier tour; il est, d'autres fois, enroulé de telle sorte que le bord supérieur atteint le plan de ce dernier tour; enfin le bord supérieur de l'ouverture peut dépasser le plan du dernier tour (pl. xcix, fig. 10 de l'ouvrage cité ci dessus (1876) de S. HANLEY et W. THEOBALD).

1876. *Planorbis compressus* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii, et p. 40, pl. xcix, fig. 4.
1878. *Planorbis compressus* SOWERBY, Monograph of the genus *Planorbis*, in : L. REEVE, *Conchologia Iconica*, London, XX, pl. xiv, fig. 118a et 118b.
1878. *Planorbis (Nautilina) saigonensis* NEVILL, *Hand List Mollusca Indian Museum Calcutta*, I, p. 244, No. 26.
1878. *Planorbis (Nautilina) compressus* NEVILL, loc. supra cit., I, p. 244, No. 34.
1881. *Planorbis confusus* DE ROCHEBRUNE, *Bulletin Société philomatique Paris*, p. 32.
1886. *Planorbis compressus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit. XVII, Nürnberg, p. 107, No. 71, taf. xvii, fig. 10 (indiqué, par erreur, taf. xvi, dans le texte).
1886. *Planorbis saigonensis* CLESSIN, loc. supra cit., p. 191, taf. xix, fig. 3.
1891. *Planorbis saigonensis* FISCHER, *Société Histoire natur. Autun*, p. 126.
1891. *Planorbis confusus* FISCHER, *Société Histoire natur. Autun*, p. 126.
1904. *Planorbis saigonensis* FISCHER et DAUTZENBERG, *Catalogue Mollusques Indo-Chine*, in : *Mission Pavie*, p. 414.
1904. *Planorbis confusus* FISCHER et DAUTZENBERG, loc. supra cit., p. 414.
1905. *Planorbis saigonensis* FISCHER et DAUTZENBERG, *Journal de Conchyliologie*, LIII, p. 117.
1909. *Planorbis saigonensis* GERMAIN, *Records Indian Museum Calcutta*, III, part iii, p. 117.
1910. *Planorbis confusus* BAVAY et DAUTZENBERG, *Journal de Conchyliologie*, LVIII, p. 18.
1910. *Planorbis saigonensis* BAVAY et DAUTZENBERG, *Journal de Conchyliologie*, LVIII, p. 18.
1915. *Planorbis (Gyraulus) compressus* PRESTON, *Fauna of British India : Mollusca [Freshwater Gasteropoda and Pelecypoda]*, London, p. 118, No. 233.
1918. *Planorbis saigonensis* ANNANDALE, *Mollusca of the Tai Hu, Memoirs Asiatic Society of Bengal*, VI, Calcutta, p. 304.

LOCALITÉS :

Indes :¹ Assam, sans indication précise de localité [DR. F. STOLICZKA] ; 30 exemplaires ; = Bangalore ; 10 exemplaires subfossiles ; = Bombay [Rev. S. B. FAIRBANK] ; 10 exemplaires² + 3 exemplaires de grande taille, subfossiles ; = Calcutta [DR. J. BAXTER] ; nombreux exemplaires³ ; = Calcutta ; 5 exemplaires⁴ ; = Calcutta, dans le Maidan tank [DR. N. ANNANDALE] ; un exemplaire ; = Port Canning [G. NEVILL] ; nombreux exemplaires⁵ ;

¹ Pour faciliter les recherches, les localités de l'Inde sont classées par ordre alphabétique.

² Exemplaires au test mince, léger, d'un corné très blond, subtransparent.

³ Quelques individus atteignent 8 millimètres de diamètre maximum ; certains échantillons sont plus ou moins déformés : leur enroulement est plus lent et plus régulier, avec un dernier tour descendant sur la seconde moitié de son développement.

⁴ Ils atteignent 6 et 6½ millimètres de diamètre maximum. Leur test est léger, presque transparent, d'un beau corné olivâtre brillant, garni de bien marquées, serrées, inégales et obliques.

⁵ Certains individus sont de très grande taille : 8—8½—9 millimètres de diamètre.

= Port Canning; deux exemplaires de petite taille et un jeune; = Chandernagore [Colonel G. B. MAINWARING]; 6 exemplaires¹; = Dakali [J. WOOD-MASON]; un exemplaire jeune; = Delhi [J. WOOD-MASON]; nombreux exemplaires²; = Dharampur, Simla Hills, vers 5,000 pieds [= 1700 mètres environ], dans les auge à bestiaux [DR. N. ANNANDALE]; un exemplaire; No. M. $\frac{4066}{1}$ ³; = Jamálpur [DR. F. STOLICZKA]; 6 exemplaires; = Kutch [DR. F. STOLICZKA]; 2 exemplaires de petite taille dont un subfossile = Madras [H. F. BLANFORD]; très nombreux exemplaires; = Madras (Madras town) [DR. N. ANNANDALE]; 3 Novembre 1908; nombreux exemplaires; No. M. $\frac{4268}{1}$ ⁴; = Manbhum [W. THEOBALD]; 8 exemplaires⁵; + 9 exemplaires⁶; = Moradabad [Collect. Asiatic Society of Bengal]; 6 exemplaires de petite taille; = Patna [Coll. M.]; 2 exemplaires subfossiles⁷; = Pooree (= Puri) [H. RABAN]; 4 exemplaires⁸; = Sámbar Lake [DR. F. STOLICZKA]; 10 exemplaires⁹; = Serampore [Collect. Asiatic Society of London]; 3 exemplaires de petite taille + 8 exemplaires de petite taille + 12 exemplaires¹⁰; = Ferozepore; quelques exemplaires jeunes; = Vellore [G. NEVILL]; 10 exemplaires.

Ile de Ceylan: sans indication précise de localité [G. NEVILL]; 4 exemplaires.¹¹

Afghanistan: Gaud-i-Zirreh at Gardun Reg (shells from clay on right bank of [A. H. MCMAHON]; 14 Novembre 1903; nombreux exemplaires subfossiles de taille moyenne¹²;

Yunnan: Sanda [DR. J. ANDERSON]; 5 exemplaires.¹³

Chine: Chusan [Coll. CANTOR, ex DAMON]; 4 exemplaires; = Tai Hu or Great Lake [DR. N. ANNANDALE]; nombreux exemplaires.¹⁴

tre maximum. Le test est mince, léger, subtransparent, d'un corné blond parfois teinté de marron ou de fauve clair; Il est des échantillons qui ont un dernier tour descendant à l'extrémité avec une spire à enroulement un peu plus serré que dans le type. La sculpture est délicate, mais assez irrégulière.

¹ Test très mince, assez brillant, d'un corné clair.

² Quelques individus ont 8 millimètres de diamètre maximum. Le test varie du corné blond très clair au corné marron clair et brillant. L'ouverture est parfois garnie d'un léger bourrelet interne blanc.

³ Cet exemplaire, peu typique, a un dernier tour très descendant. Remarquons la singulière station où le DR. N. ANNANDALE a recueilli cette espèce.

⁴ Individus jeunes et adultes. Le test est d'un corné peu brillant, marron ou brun. Les jeunes ont un test plus clair, plus brillant et plus transparent.

⁵ Test marron, peu brillant.

⁶ Beaucoup plus petits que les précédents, ces individus ont un test corné aunâtre, presque blanc, subtransparent.

⁷ Diamètre maximum: $5\frac{1}{2}$ millimètres.

⁸ Individus jeunes au test d'un corné blanchâtre, subtransparent.

⁹ Parmi lesquels des individus très jeunes et des adultes de petite taille. Tous ont un test d'un corné blanc, laiteux, absolument transparent.

¹⁰ Individus de petite taille au test blanc hyalin, presque transparent.

¹¹ Ces quatre individus appartiennent à une petite forme fort peu typique se rattachant, peut-être, au *Planorbis* (*Gyraulus*) *Sielzneri* Dohrn.

¹² Le test est, parfois, d'un corné blanc, absolument transparent.

¹³ Petite forme moins comprimée, au test plus foncé, rappelant la variété *chinensis* Dunker (Voir, un peu plus loin, p. 112, de ce Mémoire).

¹⁴ Cette espèce est très abondante sur les pierres des rives du lac Tai Hu ainsi que parmi les herbes d'un canal à Soochow [DR. N. ANNANDALE, *Mollusca of the Tai Hu, Memoirs Asiatic Society of Bengal*, VI, Calcutta, 1918, p. 304].

DISTRIBUTION GÉOGRAPHIQUE :

Le *Planorbis* (*Gyraulus*) *saigonensis* Crosse et Fischer est une espèce souvent très commune dans les eaux douces de l'Extrême-Orient. Elle vit, sous des formes il est vrai un peu différentes, depuis l'Inde jusqu'au Japon,¹ aux îles de la Sonde (Sumatra [von HASSELT], Java [DR. E. von MARTENS]) et à l'île Célèbe [DR. E. von MARTENS] en passant par toute l'Indo Chine² (y compris la presqu'île de Malacca) et la Chine méridionale.³

Les détails donnés dans les pages précédents sont suffisants pour montrer le polymorphisme de cette espèce. Ajoutons cependant que la carène du dernier tour est aussi très variable : parfois très accusée, presque saillante, elle disparaît, chez certains individus, à peu près complètement, tous les intermédiaires existant entre ces deux termes extrêmes. Presque toujours médiane ou submédiane, elle est rarement inframédiane, plus rarement encore supramédiane. Quelques formes de cette espèce se rapprochent beaucoup du *Planorbis* (*Gyraulus*) *convexusculus* Hutton et il semble certain que les deux espèces sont fort peu différenciées.

A. BAVAY et PH. DUNTZENBERG⁴ ont décrit, sous le nom de variété *tigrina*,⁵ une mutation *ex colore* découverte par le Colonel MESSAGER aux environs de Hanoï (Tonkin) :

"*Testa epidermide fulvo plicato induta, plicis colore magis saturato tinctis.*"

"Cette variété présente un épiderme fauve présentant des plis parallèles aux stries d'accroissement et d'une teinte plus foncée que le reste de la surface, ce qui donne à la coquille un aspect tigré".

variété *chinensis* Dunker.

1848. *Planorbis chinensis* DUNKER, *Proceedings Zoological Society of London*, XIV, p. 41, No. 4.

1848. *Planorbis chinensis* DUNKER, *Annals and Magazine of Natural History*, London, p. 452.

LOCALITÉ :

Chine : Hongkong⁶ ; No. 78 C.

Coquille à peine subconvexe en dessus, largement ombiliquée en dessous (les premiers tours assez profondément enfoncés) ;

¹ Sous la forme de variété *japonensis* Martens.

² Cette espèce est souvent abondante en Cochinchine [PAVIE] et au Tonkin, notamment aux environs d'Hanoï [BLAISE, A. KREMPF, Colonel MESSAGER, etc. . . .]

³ Sous la forme de la variété *chinensis* Dunker (cf. : *infra*, p.)

⁴ BAVAY (A.) et DAUTZENBERG (PH.), Contributions à la faune fluviatile de l'extrême Orient (Chine et Indo-Chine) ; *Journal de Conchyliologie*, LVIII, Paris, 1910, p. 18.

⁵ *Planorbis confusus* Rochebrune, variété *tigrina* Bavay et Dautzenberg.

⁶ C'est de cette même localité—la seule actuellement connue—que provenait le type de H. CUMING (actuellement au *British Museum* de Londres) décrit par W. DUNKER.

spire composée de 4 tours convexes à croissance médiocrement rapide et assez régulière, le dernier pas très grand, à peu près aussi convexe en dessus qu'en dessous, dilaté et quelquefois légèrement descendant à l'extrémité, muni d'une *carène médiane faiblement marquée*; ouverture oblique, ovulaire transverse, à bords convergents réunis par une callosité blanche.

Diamètre maximum : $5\frac{1}{2}$ millimètres; diamètre minimum : $4\frac{3}{4}$ millimètres; hauteur : $1\frac{1}{4}$ millimètre.¹

Test assez solide, corné fauve, recouvert d'un enduit noirâtre, garni, en dessus et en dessous, de stries fines, subégales, serrées et peu obliquement onduleuses.

Le *Planorbis chinensis* Dunker est une variété du *Planorbis saigonensis* Crosse et Fischer peut être analogue à la variété *siamensis* Martens, mais les descriptions de W. DUNKER sont si incomplètes qu'il est difficile d'en avoir la certitude.

variété aberrans Martens.

1887. *Planorbis aberrans* MARTENS, *Malakozoolog. Blätter*, XIV, p. 215, No. 5.

1886. *Planorbis aberrans* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 155, No. 134, taf. xxiii, fig. 6.

LOCALITÉ :

Chine : Canton ; 4 exemplaires ; No. 245.

Je rapporte à la coquille décrite par le DR. E. von MARTENS² un Planorbe qui n'est, bien certainement, qu'une déformation plus ou moins accentuée du *Planorbis (Gyraulus) saigonensis* Crosse et Fischer. Les caractères de la spire sont les mêmes, mais l'enroulement est irrégulier. Les premiers tours sont presque normaux, mais les deux derniers sont très fortement déviés : chez un individu le dernier tour est fortement descendant à l'extrémité, si bien que l'ouverture est détachée et le péristome continu. A un degré moindre, on observe la même chose chez les autres exemplaires. Cette allure du dernier tour rend la spire légèrement étagée en dessus et la coquille très excavée en dessous.

Diamètre maximum : 6 millimètres; diamètre minimum : 5 millimètres.

Test mince, léger, fragile, transparent, garni, en dessus et en

¹ Les dimensions données par W. DUNKER (*loc. supra cit.*, 1848, p. 41) sont : $2\frac{1}{2}$ lignes [= $4\frac{3}{4}$ millimètres] de diamètre et $\frac{3}{4}$ de ligne [= $1\frac{1}{10}$ millimètre] de hauteur.

² "Testa depressa, supra et infra subaequaliter plana, ad peripheriam rotundata, distincte striatula, albida, opaca; anfr. 4—5, subteretes, lente crescentes, sutura profunda; apertura modice obliqua, subelliptica, parva, peristomate tenui."

"Diam. maj. 5, min. $4\frac{1}{4}$, alt. vix 1; apert. lat. 1, alt. vix 1 mill."

"China bei Shanghai".

MARTENS (DR. E.), Ueber die ostasiatischen Limnaeaceen, *Malakozoolog. Blätter*, XIV, 1867, p. 215, No. 5.

dessous, de stries longitudinales fines, irrégulières, onduleuses et un peu obliques.

Le dernier tour n'est nullement caréné; il est seulement sub-comprimé comme chez de nombreux exemplaires du *Planorbis* (*Gyraulus*) *saigonensis* Crosse et Fischer.

Planorbis (*Gyraulus*) *malaccaensis* Germain.

1848. *Planorbis nitidulus* DUNKER, *Proceedings Zoological Society of London*, p. 40, No. 2 [non : DE LAMARCK, 1807].
 1848. *Planorbis nitidulus* DUNKER, *Annals and Magazine of Natural History*, London, p. 452.
 1878. *Planorbis nitidulus* SOWERBY, Monograph of the genus *Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, pl. vii, fig. 61a—61b.

LOCALITÉ :

Asie : Presqu'île de Malacca, sans indication précise de localité; No. P. 119 B.

DISTRIBUTION GÉOGRAPHIQUE :

Cette espèce est inconnue en dehors de la presque-île de Malacca où elle a été signalée par G. DUNKER [in : Collect. H. CUMING (*British Museum*)].

D'après les individus du Musée d'Histoire naturelle de Calcutta, le *Planorbis* (*Gyraulus*) *malaccaensis* Germain a un dernier tour arrondi et un peu dilaté à l'extrémité, surtout en dessous; son ouverture est ovale transverse à bords marginaux assez écartés, le supérieur dépassant beaucoup le columellaire.

Le diamètre maximum n'est que de $3\frac{1}{2}$ millimètres. Les individus du *British Museum*, décrits par G. SOWERBY [in : L. REEVE, *loc. supra cit.*, 1878, sp. 61], sont de taille presque double, puisqu'ils atteignent $6\frac{1}{2}$ millimètres de diamètre maximum.

Le test est mince, d'un corné jaune pâle, subtransparent, très finement strié longitudinalement en dessus et en dessous : les stries sont obliquement onduleuses, un peu irrégulières, légèrement plus fines en dessous qu'en dessus. Comme chez beaucoup de *Gyraulus* de l'Inde et de l'Extrême Orient, le test est recouvert de nombreuses carapaces de Diatomées.

La diagnose donnée par G. DUNKER est fort brève :

"Pl. testa parvula, pallide corneo-fulvescente, nitidula, pelucida, supra profunde umbilicata, basi plana; aufractibus $3\frac{1}{2}$ rotundatis; apertura oblique ovata" ¹.

Aussi est-il fort difficile de se faire une idée exacte de cette espèce que le DR. E. von MARTENS ² assimile, avec doute il est

¹ Dunker (G.), Diagnoses Specierum novarum generis *Planorbis* collectionis Cumingianae, *Proceedings Zoological Society of London*, part XVI, 1848, p. 40, No. 2.

² MARTENS (DR. E. von), Ueber die ostasiatischen Limnaeaceen, *Malakozoolog. Blätter*, XIV, Cassel, 1867, p. 214.

vrai, au *Planorbis (Gyraulus) saigonensis* Crosse et Fischer. Il est possible que cette opinion soit exacte, d'autant que la seule figuration de ce Planorbe, celle donnée par G. SOWERBY dans l'Iconographie de L. REEVE, vient à l'appui de cette assertion.¹

Cependant le Planorbe de Malacca diffère du *Planorbis (Gyraulus) saigonensis* Crosse et Fischer, en dehors de sa taille plus petite, par son dernier tour beaucoup mieux arrondi et son ouverture de forme différente. Il semble ainsi constituer au moins une variété locale du véritable *Planorbis (Gyraulus) saigonensis* Crosse et Fischer qu'il est possible de conserver provisoirement jusqu'au jour où des matériaux de comparaison suffisants permettront de résoudre définitivement cette question.

Le nom de *Planorbis nitidulus* ayant été employé antérieurement par J. B. M. DE LAMARCK pour un Planorbe fossile du tertiaire de Grignon (Seine-et-Oise)², je lui ai substitué celui de *Planorbis (Gyraulus) malaccaensis* Germain.

Planorbis (Gyraulus) Stewarti Germain.

1909. *Planorbis Stewarti* GERMAIN, *Records Indian Museum Calcutta*, III, part ii, p. 119 (figuré à la même page).

LOCALITÉ :

Tibet : Rham-Tso, à 14,700 pieds, dans les herbes d'un lac, avec le *Planorbis (Gyraulus) himalayaensis* Hutton ; 12 Août 1907 ; No. 76 [Capt. F. H. STEWART].

Cette espèce se rapproche beaucoup du *Planorbis (Gyraulus) saigonensis* Crosse et Fischer dont elle se sépare :

Par sa coquille plus bombée en dessus et beaucoup plus profondément ombiliquée en dessous ; par sa spire à croissance plus régulière ; par son dernier tour proportionnellement bien moins grand et nettement arrondi ; par ses sutures plus profondes ; enfin par son ouverture plus ovale-arrondie, à bords plus rapprochés.

La taille du *Planorbis Stewarti* Germain atteint $4\frac{3}{4}$ millimètres de diamètre maximum, $3\frac{1}{4}$ millimètres de diamètre minimum et $1\frac{1}{2}$ millimètres de hauteur. Le test est solide, un peu épais, brillant, jaune ambré ; il est orné de stries très fines, très serrées, un peu irrégulières, bien obliques et légèrement onduleuses, plus fines en dessous qu'en dessus.

Planorbis (Gyraulus) velifer Annandale.³

1918. *Planorbis velifer* ANNANDALE, *Records Indian Museum*, XIV, Calcutta, Août 1918, p. 112, pl. xi, fig. 7 à 11.

¹ La figure 61a de l'Iconographie de L. REEVE (XX, 1878) rappelle, en effet, beaucoup la figure 4, planche xcix de l'ouvrage de S. HANLEY et W. THEOBALD (*Conchologia Indica*, London, 1876) représentant le *Planorbis (Gyraulus) saigonensis* Crosse et Fischer [= *Planorbis compressus* Hutton]

² LAMARCK (J. B. M. DE), Mémoire sur les fossiles des environs de Paris, *Annales du Muséum Hist. natur. Paris*, V, 1807, p. 151, No. 1 (Velin [de la Bibliothèque du Muséum] No. 46, fig. 18) [*Planorbis nitidula*].

³ Le nom de *velifer* donné par N. ANNANDALE à son espèce, rappelle l'espèce

LOCALITÉ :

Inlé Lake, commun dans toutes les parties du lac, parmi les végétaux aquatiques (province de Yawngnaw, sur le Shan Plateau, vers 900 mètres d'altitude) [N. ANNANDALE]; nombreux exemplaires; type: No. M. $\frac{11.222}{1}$.

Cette espèce n'est peut-être, d'après N. ANNANDALE [*loc. supra cit.*, XIV, 1918, p. 113] qu'une simple phase lacustre du *Planorbis* (*Gyraulus*) *saigonensis* Crosse et Fischer. Elle est plus petite que celle de H. CROSSE et P. FISCHER (diamètre maximum: $3\frac{1}{2}$ millimètres; hauteur maximum: 1,75 millimètre) sa sculpture est plus délicate et plus régulière et la forme de son ouverture est très différente.

Une variété *ciliata* Annandale (*loc. supra cit.*, XIV, 1918, p. 112, pl. xi, fig. 9) est caractérisée par un nombre variable (ordinairement cinq ou six) de rangées spirales de poils épidermiques extrêmement courts et très serrés les uns contre les autres. Cette décoration épidermique existe parfois aussi chez le *Planorbis* (*Gyraulus*) *saigonensis* Crosse et Fischer¹, mais elle est toujours moins développée chez ce dernier Planorbe que chez le *Planorbis* (*Gyraulus*) *velifer* Annandale.

Planorbis (Gyraulus) labiatus Benson.

1850. *Planorbis labiatus* BENSON, *Annals and Magazine of Natural History*, ser. 2, Vol. V, London, p. 350 [non *Planorbis labiatus* WESTERLUND, *Fauna Molluscorum Suec.*, Norveg. et Daniae, 1873, p. 375, qui est une variété du *Planorbis* (*Tropidiscus*) *planorbis* Linné].
1915. *Planorbis (Gyraulus) labiatus* PRESTON, *Fauna of British India: Mollusca (Freshwater Gastropoda and Pelecypoda)*, London, p. 119, No. 235, fig. 5 (à la page 235).
1919. *Planorbis labiatus* ANNANDALE, *Records Indian Museum* XVI, part I, No. 6, Calcutta, Janvier 1919, p. 145.

LOCALITÉ :

Indes anglaises: Etang à Khandalla, dans le Poona district, vers 2500 pieds au dessus du niveau de la mer [N. ANNANDALE]; un exemplaire.

DISTRIBUTION GÉOGRAPHIQUE :

Cette rare espèce a été découverte à Moradabad, parmi de nombreux individus du *Planorbis* (*Gyraulus*) *saigonensis* Crosse et Fischer.

de voile qui entoure la périphérie du dernier tour. Cette sorte de velum proéminent, qui est rarement tout à fait absent, a une apparence gélatineuse. Il est rempli de Bactéries. Je pense, avec N. ANNANDALE, qu'il faut attribuer cette formation à un parasite.

¹ Comme N. ANNANDALE l'a lui-même observé (*Freshwater Shells from Mesopotamia*, *Records Indian Museum*, XV, part iii, No. 20, Calcutta, Août 1918, p. 166).

Le *Planorbis* (*Gyraulus*) *labiatus* Benson est une espèce remarquable par sa spire, composée de $3\frac{1}{2}$ tours convexes à croissance très rapide, le dernier étant grand, bien dilaté et descendant à son extrémité. L'ouverture est grande, très obliquement cordiforme.

La taille atteint 5 millimètres de diamètre maximum pour 4 millimètres de diamètre minimum et 2 millimètres de hauteur.

Planorbis (*Gyraulus*) *saltensis* Germain, *nov. sp.*

LOCALITÉ :

Indes : Salt Range, Punjab. Un seul exemplaire subfossile.

Coquille assez déprimée convexe en dessus, subconvexe en dessous ; spire composée de $3\frac{1}{2}$ tours à *croissance rapide*, les premiers très petits et très enfoncés, principalement en dessous ; dernier tour très grand, bien dilaté à l'extrémité, à peu près aussi convexe en dessus qu'en dessous, légèrement descendant vers le dernier quart apertural, garni d'une carène médiane assez saillante ; ouverture très oblique, ovulaire transverse, à bords rapprochés et convergents réunis par une forte callosité blanche ; péristome encrassé intérieurement.

Diamètre maximum : 6 millimètres ; diamètre minimum : $4\frac{1}{2}$ millimètres ; hauteur : $1\frac{5}{8}$ millimètres ; diamètre de l'ouverture : $2\frac{1}{2}$ millimètres ; hauteur de l'ouverture : 2 millimètres.

Test peu fragile, garni, en dessus, de stries longitudinales fines, inégales, très obliques, devenant plus fortes et plus irrégulières vers l'ouverture et, en dessous, de stries longitudinales également irrégulières.

Deux exemplaires d'un Planorbe, recueilli à Chandernagore, se rapprochent de l'espèce que je viens de décrire ; mais ils sont proportionnellement moins hauts (diamètre maximum : $6\frac{1}{2}$ millimètres ; hauteur : $1\frac{3}{8}$ millimètres), les premiers tours de spire sont beaucoup moins enfoncés et le dernier tour est notablement moins développé.¹ Ces individus doivent être rapportés au *Planorbis* (*Gyraulus*) *saigonensis* Crosse et Fischer, dont ils constituent une forme anormale à enroulement relativement rapide.

Toute autre est la coquille de Salt Range, bien distincte par les caractères de son enroulement et, notamment, par ses premiers tours *très enfoncés en dessus, extrêmement enfoncés en dessous*. Convient-il d'en faire une espèce nouvelle ? Il est difficile de se prononcer sur un seul exemplaire recueilli mort. En tous les cas la coquille est assez différente, d'une part du *Planorbis* (*Gyraulus*) *saigonensis* Crosse et Fischer et, d'autre part, du *Planorbis* (*Gyraulus*) *convexusculus* Hutton. Je lui impose, provisoirement, le nom de *Planorbis* (*Gyraulus*) *saltensis* Germain. De nou-

¹ Chez ces deux Planorbes, la carène médiane est bien accusée ; un troisième individu montre les mêmes caractères, mais la carène est presque supérieure.

veaux matériaux sont, je le répète, indispensables pour fixer définitivement la valeur de ce *Planorbe* qui, en outre, rappelle un peu le *Planorbis* (*Gyraulus*) *labiatus* Benson¹; mais ce dernier a un enroulement différent, son dernier tour est, proportionnellement, plus dilaté encore et son test possède une sculpture réticulée qui manque chez le *Planorbis* (*Gyraulus*) *saltensis* Germain.

* * *

Planorbis (*Gyraulus*) *biwaensis* Preston.

1916. *Planorbis* (*Gyraulus*) *biwaensis* PRESTON, *Annals and Magazine of Natural History*, London, 8^e ser., XVII, p. 161, pl. ix, fig. 3, 3a—3c.
 1916. *Planorbis* (*Gyraulus*) *biwaensis* ANNANDALE, *Memoirs Asiatic Society of Bengal*, VI, Calcutta, p. 44.

LOCALITÉ :

Japon : Lac Biwa, à la surface des pierres, vers l'extrémité sud du lac, peu abondant [N. ANNANDALE].

Cette localité est la seule où le *Planorbis* (*Gyraulus*) *biwaensis* Preston ait été jusqu'ici rencontré.

Planorbis (*Gyraulus*) *rotula* Benson.

1850. *Planorbis rotula* BENSON, *Annals and Magazine of Natural History*, London, 2^e série, V, p. 351.
 1876. *Planorbis rotula* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 40, pl. xcix, fig. 2—3.
 1878. *Planorbis* (*Nautilina*) *rotula* NEVILL, *Hand List Mollusca Indian Museum Calcutta*, I, p. 245, No. 37.
 1878. *Planorbis rotula* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, London, XX, sp. 121 [excl. figur. !]
 1886. *Planorbis rotula* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 228, No. 255.
 1915. *Planorbis* (*Gyraulus*) *rotula* PRESTON, *Fauna of British India : Mollusca (Freshwater Gasteropoda and Pelecypoda)* London, p. 122, No. 246.

LOCALITÉ :

Indes Anglaises : Environs de Bombay [Collect. Rev. S. B. FAIRBANK]; 20 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est spéciale à l'Inde péninsulaire.

G. B. SOWERBY in : L. REEVE (*loc. supra cit.*, 1878, sp. 121) donne une diagnose à peu près exacte de cette espèce :

¹ BENSON (W. H.), *Annals and Magazine of Natural History*, London, ser. 2, Vol. V, 1850, p. 350; figuré par H. B. PRESTON, *Mollusca, Freshwater Gasteropoda and Pelecypoda*, in : *The Fauna of British India*, London, Mars 1915, p. 119, No. 235, fig. 5.

"Pla. testa parva, pallide fulva, tumidiuscula, iaevigata, dextrali, spira depressa; anfractibus quinis, convexis, supra suturam paulo elevatis, disco inferiori late concavo; anfractibus rotundis; apertura oblique ovata" et il dit bien également, dans son texte anglais: "... whorls round" Or, la figure 121b (pl. xiv) représente un Planorbe manifestement caréné (carène légèrement inframédiane) à ouverture cordiforme. Le Planorbe figuré par S. HANLEY et W. THEOBALD (*loc. supra cit.*, 1876, pl. xcix, fig. 2) a bien, au contraire, les tours arrondis et l'ouverture "obliqua, rotundato-lunata" dont parle la diagnose originale de W. H. BENSON. En résumé:

1° La diagnose donnée par G. B. SOWERBY (in: L. REEVE) correspond bien, à quelques détails près, au *Planorbis rotula* Benson, mais les figures 121a et 121b (pl. xiv) se rapportent à une espèce toute différente;

2° Les figures de l'ouvrage de S. HANLEY et W. THEOBALD représentent également le *Planorbis rotula* Benson.

Les exemplaires du Musée d'Histoire naturelle de Calcutta correspondent à cette dernière figuration. Ils ont un test très mince, léger, transparent, corné clair parfois légèrement teinté de verdâtre, très élégamment orné de stries longitudinales¹ assez fortes, comme subcostulées, subégales, bien obliquement onduleuses, aussi accentuées en dessus qu'en dessous et très marquées même sur le premier tour. D'après la description originale de W. H. BENSON (*loc. supra cit.*, 1850, p. 351), le test montrerait une sculpture spirale: "Testa... luteo cornea, diaphana, impolita, spiraliter obsolete striata..." Malgré un examen très attentif, je n'ai pu discerner ces stries spirales sur aucun des individus appartenant aux collections du Musée de Calcutta.

Le *Planorbis (Gyraulus) rotula* Benson est voisin du *Planorbis (Gyraulus) convexiusculus* Hutton, mais il s'en distingue par sa spire à tours moins nombreux et par son dernier tour nettement arrondi.

Planorbis (Gyraulus) cherraensis Godwin-Austen.

1878. *Planorbis (Nautilina) cherraensis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 245, No. 38.

LOCALITÉ :

Cherrapungi [Collect. du Major H. H. GODWIN-AUSTEN]; cotypes.

Coquille très petite, subconvexe en dessus,² assez étroitement mais profondément ombiliquée en dessous; spire formée de 3-3½ tours convexes, les premiers très petits et très enfoncés—aussi bien en dessus qu'en dessous—à croissance très rapide; dernier

¹ G. B. SOWERBY (in: L. REEVE, sp. 121) dit, à tort, que le test de ce Planorbe est lisse: "Pla. testa... iaevigata...".

² Avec la partie centrale profondément enfoncée, mais relativement étroite.

tour très grand, bien dilaté à l'extrémité, à peu près aussi convexe en dessus qu'en dessous, muni d'une carène émoussée absolument médiane surtout visible sur la moitié aperturale; ouverture ovale transverse, un peu anguleuse au point où la carène aboutit au péristome; bords marginaux écartés—le bord supérieur dépassant très notablement le bord columellaire—réunis par une callosité blanche à peine sensible.

Diamètre maximum : 3 millimètres; diamètre minimum : $2\frac{1}{2}$ millimètres; hauteur : $\frac{3}{4}$ millimètre.

Test mince, fragile, corné clair, absolument transparent, garni, en dessus et en dessous, de stries longitudinales nettement marquées, obliquement subonduleuses, subégales, serrées, très élégamment disposées et sensiblement aussi accentuées en dessous qu'en dessus. Il n'y a pas de sculpture spirale.

G. NEVILL¹ suggère que cette espèce est synonyme du *Planorbis* (*Gyraulus*) *rotula* Benson. La description ci-dessus, établie d'après les cotypes de H. H. GODWIN-AUSTEN montre qu'elle est certainement différente puisque le *Planorbis* (*Gyraulus*) *rotula* Benson possède 5 tours de spire convexes avec un dernier tour nettement arrondi tandis que le *Planorbis* (*Gyraulus*) *cherraensis* Godwin-Austen n'en compte que 3 à $3\frac{1}{2}$, le dernier étant caréné sur sa moitié aperturale. De plus, cette dernière espèce est de taille plus petite et son dernier tour est bien plus dilaté à son extrémité.

Planorbis (*Gyraulus*) *Stelzneri* Dohrn.

- 1858. *Planorbis Stelzneri* DOHRN, *Proceedings Zoological Society of London*, p. 134 [non : E. von MARTENS].
- 1878. *Planorbis Stelzneri* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 60, pl. cli, fig. 4 et 7.
- 1876. *Planorbis Stelzneri* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, London, XX, pl. v, fig. 36a--36b.
- 1886. *Planorbis Stelzneri* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 117, No. 84, taf. xi, fig. 11.
- 1915. *Planorbis* (*Gyraulus*) *Stelzneri* PRESTON, *Fauna of British India : Mollusca (Freshwater Gasteropoda and Pelecypoda)*, London, p. 123, No. 247.

LOCALITÉS :

Indes Anglaises : Delhi et Port Canning; nombreux exemplaires; No. P. 120 B.

DISTRIBUTION GÉOGRAPHIQUE.

Découvert dans l'île de Ceylon [H. DOHRN], ce *Planorbe* est particulier à cette île et à l'Inde péninsulaire. Il est remplacé, dans la Chine, par une espèce voisine, le *Planorbis* (*Gyraulus*) *membranaceus* Gredler.²

¹ NEVILL (G.), *Handlist Mollusca Indian Museum Calcutta*, I, Calcutta, 1878, p. 245 : "[? = *Planorbis rotula* Benson]."

² GREDLER (P. V.), *Zur Conchylien-Fauna von China*, V, *Jahrbuch. der Deutschen Malakozoolog. Gesellschaft*, Frankfurt a. M., XI, 1884, p. 153.

Les nombreux exemplaires de ce Planorbe appartenant au Musée d'Histoire naturelle de Calcutta ont un test corné jamâtre très clair, à peu près transparent. En dessus, les stries longitudinales sont bien burinées, un peu saillantes,¹ subégales, serrées, médiocrement obliques et onduleuses; en dessous ces stries longitudinales sont plus fines et un peu moins obliques. Il n'y a pas trace de sculpture spirale.

Les plus grands exemplaires mesurent 5 millimètres de diamètre maximum, $4\frac{1}{2}$ millimètres de diamètre minimum et $1\frac{1}{2}$ à $1\frac{3}{4}$ millimètre de hauteur.²

L'enroulement des tours de spire est assez lent, à peu près semblable en dessus et en dessous, avec un dernier tour médiocre, *caréné*, légèrement élargi à l'extrémité. On observe, à l'intérieur de l'ouverture, un léger épaissement blanc bordant le péristome.³

La diagnose de G. B. SOWERBY [*in*: L. REEVE, *loc. supra cit.*, 1878, sp. 36) est fort peu exacte.⁴ Il en est de même de la figure 36a (pl. v) donnant le profil de la coquille: on y voit une carène subbasale saillante qui n'existe jamais à cette place. En réalité, la carène est submédiane⁵ et elle est surtout accentuée sur la deuxième moitié du dernier tour, c'est-à-dire, lorsqu'on regarde la coquille de profil, du côté opposé à l'ouverture.⁶ Les figures données par S. HANLEY et W. THEOBALD [*loc. supra cit.*, 1876, pl. cli, fig. 4 et 7] et S. CLESSIN [*loc. supra cit.*, 1886, taf. xi, fig. 11] sont beaucoup plus correctes.

Planorbis (Gyraulus) nanus Benson.

Pl. II, fig. 10, 11 et 12.

1856. *Planorbis nanus* BENSON, *Proceedings Zoological Society of London*, p. 186.
 1878. *Planorbis nanus* SOWERBY, Monograph of the genus *Planorbis*, *in*: L. REEVE, *Conchologia Iconica*, XX, London, pl. ix, fig. 75a—75b.
 1915. *Planorbis (Gyraulus) nanus* PRESTON, *Fauna of British India: Mollusca (Freshwater Gasterop. and Pelechypoda)*, London, p. 122, No. 245.

LOCALITÉ :

Indes Anglaises : NEPAL, Pharping [R. HODGART]; un exemplaire; No. M. $\frac{3823}{1}$.

¹ Mais ces stries restent, cependant, médiocrement fortes.

² Ce Planorbe atteint jusqu'à 7 millimètres de diamètre maximum et $5\frac{1}{2}$ millimètres de diamètre minimum.

³ Ce caractère avait été remarqué par H. DOHRN: "... peristomium rectum, intus albolabiatum" (*loc. supra cit.*, 1858, p. 134).

⁴ G. B. SOWERBY dit notamment: "... anfractibus quinis, superne convexiusculis, supra medium subangulatis, tum versus columellam inclinatis..." ce qui n'est pas exact. La spire n'a que 4 tours.

⁵ "... anfract. 3—4 vix convexi, ultimus acute carinatus..." dit H. DOHRN (*loc. supra cit.*, 1858, p. 134).

⁶ A l'endroit où cette carène atteint le péristome, l'ouverture montre une angulosité assez marquée.

DISTRIBUTION GÉOGRAPHIQUE.

Ce rare Planorbe n'est connu que d'un petit nombre de localités de l'Inde. Il a été découvert, à l'état subfossile, dans le lac Tsoral (Tibet) [Capt. H. STRACHEY].

Coquille déprimée, subconvexe avec une excavation étroite et assez profonde en dessus, un peu concave en dessous; spire composée de $3\frac{1}{2}$ tours convexes à croissance assez rapide, séparés par des sutures profondes; dernier tour grand, arrondi, à peu près aussi convexe en dessus qu'en dessous, muni d'une carène submédiane émoussée très sensible sur la moitié aperturale,¹ légèrement dilaté à son extrémité; ouverture obliquement ovulaire-transverse, à bords convergents réunis par une faible callosité blanche.

Diamètre maximum: 6 millimètres; diamètre minimum: 5 millimètres; hauteur maximum: 2 millimètres; hauteur de l'ouverture: 2 millimètres; diamètre de l'ouverture: $2\frac{1}{2}$ millimètres.

Test médiocrement épais, jaune corné clair, recouvert d'un épiderme limoneux très adhérent d'un brun marron; en dessus, stries longitudinales assez serrées, fines, inégales, obliquement onduleuses;² en dessous, même système de stries mais plus délicates.

Cette description est faite d'après l'exemplaire appartenant au Musée de Calcutta. Cet individu diffère du type figuré par G. SOWERBY³ par son dernier tour un peu moins dilaté à son extrémité mais surtout par sa taille plus faible; la coquille représentée par l'auteur anglais atteignant 11 millimètres de diamètre maximum et 10 millimètres de diamètre.

Planorbis (Gyraulus) himalayaensis Hutton.

1886. *Planorbis himalayanus* HUTTON, in: CLESSIN, Die Familie der Limnaeiden, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 141, No. 118, taf. xx, fig. 8
1909. *Planorbis himalayaensis* GERMAIN, *Records Indian Museum Calcutta*, III, part ii, p. 120.
1915. *Planorbis (Gyraulus) himalayanus* PRESTON, *Fauna of British India: Mollusca [Freshwater Gastropoda and Pelecypoda]*, London, p. 121, No. 240,

LOCALITÉS:

Tibet: Te-ring-Gompa, à 14,000 pieds, près de la source de la rivière; 15 Juillet 1907 [Capt. F. H. STEWART]; = High Hill

¹ Cette carène est très fortement émoussée sur la première moitié du dernier tour: aussi est-elle à peine sensible sur la figure 10, de la planche II. On peut cependant se rendre compte de son existence sur cette figure par l'angulosité extérieure de l'ouverture.

² On observe également, en dessus, des traces de sculpture spirale; mais la présence d'un épiderme limoneux très adhérent ne m'a pas permis de préciser les ca actères de cette sculpture spirale.

³ SOWERBY (G.), in: L. REEVE, *loc. supra cit.*, 1878, pl. ix, fig. 75a—75b.

Gompa, Gyantse, à 14,500 pieds, sous les pierres et les herbes aquatiques d'une rivière; 10 Juillet 1907; No. 58 [Capt. F. H. STEWART]; = Rham-Tso, à 14,700 pieds, dans les herbes d'un lac d'environ 10 miles de long sur 6 de large; 12 Août 1907; Nos. 76 et 575 [Capt. F. H. STEWART].

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe était seulement connu, jusqu'ici, de la Tinjori Valley [W. H. BENSON, in : Collect. G. DUNKER in *Mus. Berolin.*, cf. : S. CLESSIN, in : MARTINI et CHEMNITZ, *loc. supra cit.*, 1886, p. 141].

Les exemplaires de ce Planorbis—qui présente d'étroits rapports avec le *Planorbis (Gyraulus) nanus* Benson¹—appartenant au Musée de Calcutta correspondent bien à la description et à la figuration de S. CLESSIN, mais ils sont de taille plus faible, leur diamètre maximum atteignant seulement 4 millimètres au lieu de 5½ millimètres. Le test est mince, assez solide, d'un jaune ambré clair, orné de stries un peu arquées, plus serrées et plus fortes en dessous qu'en dessus.

Planorbis (Gyraulus) barrackporensis Clessin.

- 1886. *Planorbis Barrackporensis* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet* 2^e Edit., XVII, Nürnberg, p. 125, No. 95, taf. xviii, fig. 7.
- 1886. *Planorbis Huttoni* BENSON, in : CLESSIN, *loc. supra cit.*, p. 139 No. 116, taf. xviii, fig. 4.
- 1909. *Planorbis barrackporensis* GERMAIN, *Records Indian Museum*, Calcutta, III, part ii, p. 120.
- 1915. *Planorbis (Gyraulus) barrackporensis* PRESTON, *Fauna of British India : Mollusca [Freshwater Gasterop. and Pelecypoda]*, London, p. 120, No. 239.

LOCALITÉS :

Tibet : Mang-tsa, à 14,500 pieds, dans les herbes d'un étang ne gélant pas en été; 2 Juillet 1907; No. 52 [Capt. F. H. STEWART]; = Gyantse, à 13,120 pieds; 5 Décembre 1906; No. 4 [Capt. F. H. STEWART].

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe était seulement connu, jusqu'ici, de Barrackpore (Inde) [Collect. G. DUNKER, in *Mus. Berolin.*].

Où trouve, dans la *Monographie* de S. CLESSIN, la description et l'iconographie d'un *Planorbis Huttoni* Benson mss.² qui ne

¹ Cf. p. 131, de ce Mémoire.

² Le *Planorbis Huttoni* Benson a été recueilli aux environs de Calcutta et de Benares [W. H. BENSON, in : Collect. G. DUNKER, *Mus. Berolin.*].

semble pas différer spécifiquement du *Planorbis barrackporensis* Clessin. En comparant les diagnoses et les figures originales on constate que le premier de ces Planorbes se distingue du second par sa spire à enroulement un peu plus rapide ; par son dernier tour mieux arrondi, légèrement plus dilaté à son extrémité ; enfin par son ouverture plus oblique à bords marginaux plus éloignés. Mais ces différences sont très faibles et, par ailleurs, la spire se compose, dans les deux cas, de $3\frac{1}{2}$ tours ovalaires, à croissance très rapide, le dernier très grand et très dilaté à l'extrémité. La taille est sensiblement la même : $5\frac{1}{2}$ millimètres de diamètre maximum et 1 millimètre de hauteur pour le *Planorbis Huttoni* Benson, 4 millimètres de diamètre et 1 millimètre de hauteur pour le *Planorbis barrackporensis* Clessin. Quant au test il est, chez ces deux Planorbes, d'un corné pâle brillant, parfois ambré ou fauve clair, mince, fragile, subtransparent, orné de stries longitudinales fines, serrées, bien obliques, plus délicates en dessous qu'en dessus.

§ V.

Planorbis (Gyraulus) deflectus Say.

- 1824. *Planorbis deflectus* SAY, *Long's Expedit. Report*, II, p. 261 pl. xv, fig. 8.
- 1840. *Planorbis virens* ADAMS, *American Journal of Sciences*, XXXIX, p. 274 (juv.).
- 1840. *Planorbis virens* ADAMS, *Boston Journal Natur. History*, III, p. 326, pl. iii, fig. 15 (juv.).
- 1841. *Planorbis deflectus* GOULD, *Report on the Invertebrate of Massachusetts*, p. 207, fig. 136.
- 1843. *Planorbis deflectus* DE KAY, *Zoology of New-York*, Part V, *Mollusca*, p. 65.
- 1843. *Planorbis obliquus* DE KAY, *loc. supra cit.*, Part V, p. 62, pl. iv, fig. 57a et 57b.
- 1843. *Planorbis virens* DE KAY, *loc. supra cit.*, Part V, p. 66.
- 1844. *Planorbis deflectus* HALDEMAN, *Monograph of the Limniades and other Fresh Water Univalve Shells*, p. 25, pl. iv, fig. 4 à 7.
- 1865. *Planorbis deflectus* BINNEY, *Land and Freshwater Shells of North America*, p. 129, fig. 215.
- 1870. *Planorbis deflectus* GOULD, *Report on the Invertebrate of Massachusetts*, 2^e Edit. par BINNEY, p. 494, fig. 745.
- 1860. *Nautilina deflectus* CHENU, *Manuel de Conchyliologie*, II, p. 482, fig. 3,566.
- 1878. *Planorbis (Nautilina) deflectus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 244, No. 27.
- 1878. *Planorbis deflectus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. xi, fig. 88.
- 1886. *Planorbis deflectus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 110, No. 76, taf. xi, fig. 10.
- 1905. *Planorbis (Gyraulus) deflectus* DALL, *Land and Freshwater Mollusks of Alaska*, p. 94, fig. 74.

LOCALITÉS :

Canada : Ile du Prince Edouard ; 6 exemplaires.

Etats-Unis : Environs de New-York ; 10 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe vit dans tout le Canada, l'Alaska et dans les régions des États-Unis situées au nord et à l'est du Mississipi.

Le *Planorbis (Gyraulus) deflectus* Say rappelle beaucoup certains *Gyraulus* vivant dans les régions septentrionales de l'Europe. J'ai signalé ces affinités en traitant du *Planorbis (Gyraulus) borealis* Lovén.¹

§ VI.

Planorbis (Gyraulus) circumlineatus Shuttleworth.

1878. *Planorbis circumlineatus* SHUTTLEWORTH, in : SOWERBY, Monograph of the genus *Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. vi, fig. 48a et 48b.
 1886. *Planorbis circumlineatus* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit, Nürnberg, XVII, p. 211, No. 216, taf. xxii, fig. 6 (indiqué, par erreur, dans le texte : pl. xxix, fig. 1).
 1891. *Planorbis circumlineatus* CROSSE, *Journal de Conchyliologie* XXXIX, p. 158, No. 165.

LOCALITÉ :

Antilles : Porto-Rico, Rio Blanco ; No. 4. 109. M.

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis circumlineatus* Dunker est connu d'un certain nombre d'îles des Antilles : Porto-Rico [SHUTTLEWORTH], Saint-Thomas [H. CROSSE] et Haïti [DR. G. DUNKER].

Coquille de petite taille, presque plane en dessus, avec une concavité centrale médiocre, bien concave en dessous ; spire composée de 4 à 5 tours à croissance régulière, le dernier grand, bien élargi au dernier tiers de son développement, bien convexe en dessus et en dessous ;² sutures profondes ; ouverture très obliquement descendante, irrégulièrement semi-lunaire, à bords rapprochés, très convergents, réunis par une légère callosité d'un brun marron.

Diamètre maximum : 6—9 millimètres ; diamètre minimum : 5—7½ millimètres ; hauteur : 2—2½ millimètres.

Test assez mince, un peu fragile, subtransparent, d'un corné fauve médiocrement brillant, orné de stries longitudinales relativement fortes, pliciformes, très obliques, assez serrées, irrégulières, plus fortes en dessus qu'en dessous et coupées de stries spirales extrêmement fines et délicates, irrégulières, principalement nombreuses, en dessus, au voisinage de la suture, également visibles en dessous où elles sont réparties sur presque toute la surface du dernier tour.

¹ Voyez p. 105, de ce Mémoire.

² Le dernier tour est souvent un peu plus convexe en dessous qu'en dessus.

Cette sculpture spirale, qui n'a été vue ni par G. SOWERBY¹ ni par S. CLESSIN, classe ce Planorbe, sans contestation possible, dans le sous-genre *Gyraulus*.

Planorbis (Gyraulus) lucidus Pfeiffer.

1839. *Planorbis lucidus* PFEIFFER, in *Wiegmann's Archiv für Naturg.*, V, p. 354.
 1849. *Planorbis Redfieldi* C. B. ADAMS, *Contributions to Conchology*, New-York, p. 23 [non : *Planorbis Redfieldi* SHUTTLEWORTH ; *Pl. Redfieldi* SOWERBY in : REEVE ; *Pl. Redfieldi* CLESSIN].
 1853. *Planorbis Lanierianus* D'ORBIGNY, in : RAMON DE LA SAGRA, *Histoire phys. polit. et natur. île de Cuba*, Mollusques, p. 195, No. 114, tab. xiv, fig. 1 à 4.
 1854. *Planorbis lucidus* SHUTTLEWORTH, *Diagnosen neuer Mollusken*, VII, *Mittheilungen der Naturforsch. Gesellsch. Bern*, p. 157.
 1873. *Planorbis lucidus* MARTENS, *Binnenmollusken Venezuela's*, *Festschrift . . . Gesellsch. Naturf. Freunde Berlin*, p. 198.
 1878. *Planorbis succineus* SOWERBY, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. iii, fig. 19a et 19b.
 1878. *Planorbis lucidus* SOWERBY, in : L. REEVE, *loc. supra cit.*, pl. vii, fig. 53.
 1878. *Planorbis Lanierianus* SOWERBY, in : L. REEVE, *loc. supra cit.*, pl. vii, fig. 58a et 58b.
 1878. *Planorbis (Bathymorphus) lucidus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 247, No. 53.
 1886. *Planorbis Lanierianus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 115, No. 82, taf. xi, fig. 3.
 1886. *Planorbis lucidus* CLESSIN, *loc. supra cit.*, p. 193, No. 189, taf. xxix, fig. 2.
 1890. *Planorbis lucidus* CROSSE, *Journal de Conchyliologie*, XXXVIII, p. 261, No. 380.

LOCALITÉ :

Antilles : Porto-Rico, Humacas ; No. 4. 115. M.

DISTRIBUTION GÉOGRAPHIQUE.

Le type original a été recueilli à S. Juan de Cuba [L. PFEIFFER]. Depuis, ce même Planorbe a été retrouvé, non seulement à Cuba [R. ARANGE, GUNDLACH, LANIER, RAMON DE LA SAGRA, etc. . .], mais encore à Porto-Rico [BLAUNER], à la Guadeloupe [SHUTTLEWORTH], à la Martinique, à la Jamaïque [C. B. ADAMS] et même au Venezuela, notamment aux environs de Caracas [A. ERNST].

Une confusion s'est produite au sujet de la synonymie de ce Planorbe. Sous le nom de *Planorbis Redfieldi*, C. B. ADAMS a décrit à nouveau le *Planorbis lucidus* Pfeiffer. Mais G. SOWERBY, dans la Monographie des Planorbes de l'Iconographie de L. REEVE, a figuré un *Planorbis Redfieldi* tout à fait différent ap-

¹ G. SOWERBY [*loc. supra cit.*, in : L. REEVE, *Conchologia Iconica*, XX, 1878, sp. 48] écrit : "*Pla. . . succinea, subpellucida, . . . laevi . . .*", ce qui est évidemment une erreur.

partenant au groupe du *Planorbis* (*Helisoma*) *bicarlinatus* Say tandis qu'il représentait, sous le vocable de *Planorbis succineus*, le véritable *Planorbis Redfieldi* C. B. ADAMS. S. CLESSIN, dans la Monographie des *Limnaeidae* de la nouvelle édition de MARTINI et CHEMNITZ, s'est contenté de recopier G. SOWERBY, aggravant la confusion. Il était cependant facile d'éviter cette erreur, partiellement corrigée à l'*Index alphabétique* qui termine la Monographie des Planorbes (L. REEVE). Ou y lit, en effet :

p. 1 : " *auritus* Sowerby (*Redfieldi*, by error), pl. iii, fig. 20.

p. 2 : " *Redfieldi* C. B. Adams (*succineus* Sowerby, by error), pl. iii, fig. 19.

p. 2 : " *Succineus* Swb., see *Redfieldi*, pl. iii, fig. 19."

De tout ceci il résulte :

1° Que le *Planorbis Redfieldi* C. B. Adams, représenté par G. SOWERBY sous le nom de *Planorbis succineus* (sp. 19) passe en synonymie du *Planorbis lucidus* Pfeiffer.

2° Que le nom de *Planorbis auritus* Sowerby, imprimé postérieurement, doit passer en synonymie de *Planorbis Redfieldi* Sowerby (sp. 20), ce dernier vocable désignant l'espèce de la Jamaïque à nouveau figurée par S. Clessin.

Il est incontestable que le *Planorbis Lanieri* d'Orbigny est synonyme de l'espèce de L. PFEIFFER. A. D'ORBIGNY donne à son Planorbe 6 millimètres de diamètre et 1 millimètre de hauteur. Il ajoute que la spire est "... composée de 4 tours convexes en dessus, déprimés en dessous et un peu carénés sur le bord inférieur ...".¹ Ce sont ces mêmes caractères que A. MORELET attribue à son *Planorbis taeniatus*² : "... anfract. 4, celeriter accrescentes, superius valde convexiusculi, inferius planulati, obtuse angulati ...", petite espèce de l'île des Pins, près de Cuba, sans doute synonyme également du *Planorbis* (*Gyraulus*) *lucidus* Pfeiffer.³

Toutes les descriptions de ce Planorbe données jusqu'ici sont incomplètes. Voici les caractères que j'ai reconnus sur un exemplaire appartenant au Musée d'Histoire naturelle de Calcutta :

Coquille subconvexe en dessus avec une région centrale étroitement ombiliquée, largement concave en dessous ; spire composée de 4½ tours à croissance assez rapide en dessus, bien plus lente en dessous ; dernier tour grand, notablement embrassant et à peine dilaté à l'extrémité en dessus, médiocre et à peine embrassant en dessous, plus convexe en dessus qu'en dessous et présentant inférieurement une indication subcarénale ; sutures profondes ; ouverture très obliquement semi-lunaire, rétrécie en haut, bord supérieur très obliquement subconvexe, bord inférieur à

¹ ORBIGNY (A. D') in : RAMON DE LA SAGRA, *Histoire physique, politique et naturelle de l'île de Cuba, Mollusques*, Paris, 1853, p. 195.

² MORELET (A.), *Testacea noviss. insulae Cubanae et Amer. centr.*, Paris, 1849, p. 17. Espèce figurée par S. CLESSIN, in : MARTINI et CHEMNITZ, *loc. supra cit.*, XXII, 1886, p. 138, No. 114, taf. xv, fig. 64.

³ Diamètre maximum : 5 millimètres ; hauteur : 2 millimètres.

peine subconvexe ; bords marginaux écartés réunis par une callosité marron bien marquée.

Diamètre maximum : $4\frac{1}{2}$ millimètres ; diamètre minimum : 4 millimètres ; hauteur : $1\frac{1}{2}$ millimètre.¹

Test marron, un peu brillant, subtransparent, orné en dessus de stries longitudinales fines, serrées, obliques et inégales coupées de stries spirales très fines, un peu écartées les unes des autres, visibles même sur les premiers tours de spire ; et, en dessous, de stries longitudinales beaucoup plus fines coupées de stries spirales rares et délicates.

Planorbis (Gyraulus) santacruzensis (Nevill) Germain.

Pl. IV, fig. 10, 13 et fig. 18, 19, 20 et 21.

1878. *Planorbis (Nautilina) santacruzensis* (?) NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 243, No. 24 (*nomen nudum*).

LOCALITÉ :

Antilles : Ile Saint-Croix [Prof. W. NEWCOMB] ; 20 exemplaires.

Coquille petite, aplatie ou à peine subconvexe ou dessus, assez étroitement mais profondément ombiliquée² en dessous ; spire composée de 4— $4\frac{1}{2}$ tours—les premiers très petits—à croissance rapide séparés par des sutures profondes ; dernier tour très grand, bien plus convexe en dessous qu'en dessus, avec une très vague angulosité inframédiane,³ à peine descendant mais fortement dilaté à l'extrémité ; ouverture fortement oblique, ovulaire transverse, à bords convergents et très rapprochés réunis par une forte callosité blanche ; péristome plus ou moins légèrement épaissi intérieurement.

Les dimensions de quelques individus sont données dans le tableau suivant :

Diamètre maximum.	Diamètre minimum.	Hauteur maximum.	Diamètre de l'ouverture.	Hauteur de l'ouverture.
5 mill.	$3\frac{1}{2}$ mill.	2 mill.	2 mill.	$2\frac{1}{2}$ mill.
$4\frac{3}{4}$ —	$3\frac{3}{4}$ —	2 —	$1\frac{3}{4}$ —	2 —
$4\frac{1}{2}$ —	$3\frac{1}{2}$ —	$1\frac{1}{2}$ —	$1\frac{1}{2}$ —	$1\frac{3}{4}$ —
$4\frac{1}{4}$ —	$3\frac{1}{4}$ —	$1\frac{1}{4}$ —	$1\frac{1}{4}$ —	$1\frac{1}{2}$ —
4 —	$3\frac{1}{4}$ —	$1\frac{1}{4}$ —	$1\frac{1}{2}$ —	$1\frac{1}{2}$ —

¹ Ces dimensions sont relativement faibles. Nous avons vu précédemment que A. D'ORBIGNY donne 6 millimètres de diamètre maximum à ce Planorbe. Le DR. E. von MARTENS [*Die Binnenmollusken Venezuela's, Festschrift . . Gesellsch Naturforsch. Freunde Berlin*, 1873, p. 198] indique 7 millimètres de diamètre maximum pour 2 millimètres de hauteur. Enfin les exemplaires figurés par G. SOWERBY [*in* : L. REEVE, Vol. XX, 1878, fig. 58a—58b] atteignent jusqu'à $10\frac{1}{2}$ millimètres de diamètre maximum et 9 millimètres de diamètre minimum.

² L'ombilic laisse voir toute la spire.

³ Il n'y a pas de carène : le dernier tour, assez nettement arrondi, montre une angulosité très émousée dont la place est variable : généralement inframédiane elle est, parfois, subbasale avec toutes les positions intermédiaires.

Test mince, mais assez solide, d'un corné jaunâtre clair en dessous, un peu ambré en dessus, subtransparent ; sculpture composée, en dessus, de stries longitudinales assez fines, serrées, obliques, subégales, coupées de stries spirales nombreuses, un peu serrées, aussi fortement marquées que les stries longitudinales et visibles dès les premiers tours de spire ; même système sculptural en dessous, mais plus délicat.

Ce Planorbe est surtout intéressant par son enroulement : à peine convexes en dessus, les tours sont, au contraire, bien convexes en dessous où le dernier limite une cavité ombilicale laissant voir toute la spire. La forme de l'ouverture est assez particulière et la sculpture spirale bien accusée.

Le *Planorbis* (*Gyraulus*) *santacruzensis* (Nevill) Germain semble assez constant quant à sa forme générale et à son enroulement (aussi bien en dessus qu'en dessous) ; mais son ouverture pré-

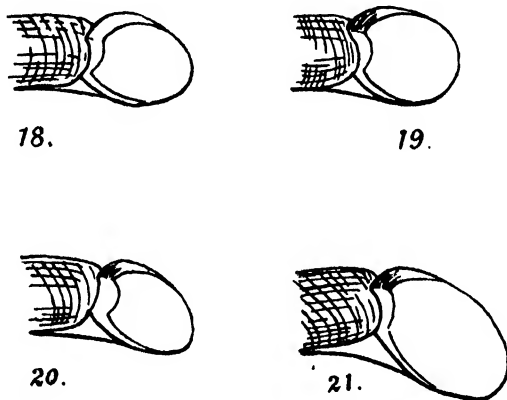


FIG. 18 19, 20 et 21. *Planorbis* (*Gyraulus*) *santacruzensis* (Nevill) Germain. Ile Sainte-Croix (Antilles). Schémas montrant les variations de l'ouverture ; $\times 10$ environ.

sente des variations assez étendues. Tantôt presque régulièrement ovale (fig. 19, dans le texte), tantôt bien plus oblique (fig. 18 et fig. 20, dans le texte), elle est parfois très obliquement transverse (fig. 21, dans le texte), tous les intermédiaires existant d'ailleurs entre les formes extrêmes. Mais, quelque soit la forme de l'ouverture, les bords marginaux restent toujours très rapprochés et convergents. L'encrassement péristomal est plus ou moins épais ; il en est de même de la callosité réunissant les bords marginaux.

Cette espèce est restée inconnue jusqu'ici. Elle est seulement citée—sans nom d'auteur, sans description, sans référence bibliographique ou iconographique—par G. NEVILL, dans son Catalogue des Mollusques du Musée de Calcutta. La description ci-dessus a été faite d'après les exemplaires¹ types recueillis à l'île Sainte-Croix [Santa-Cruz], dans les Antilles, par le PROF. W. NEWCOMB.

¹ Ces exemplaires appartiennent au Muséum d'Histoire naturelle de Calcutta.

§. VI.

Planorbis (Gyraulus) planissimus Mousson.

1869. *Planorbis planissimus* MOUSSON Cat. IV Mus. Godefroy p. 69.
 1879. Do. Do. Cat. V — p. 88.
 1882. *Planorbis planissimus* TATE, *Proceedings Linnean Society New South Wales*, VI, p. 559.
 1886. *Planorbis planissimus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat-Conchylien-Cabinet*, 2^e Edit. XVII, Nürnberg, p. 165, No. 19, taf. xxiv, fig. 7.

LOCALITÉ :

Australie : Brisbane [Collect. G. NEVILL] ; No. M. $\frac{1100}{1700}$

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce paraît spéciale à l'Australie où elle est connue notamment du Cap York (*Mus. Berlin.*, No. 13.223 et No. 18.239) et de Rockhampton [WESSEL, in : Collect. G. DUNKER, *Mus. Berlin*, cf. : S. CLESSIN, *loc. supra cit.* 1886, p. 166].

La spire de ce Planorbe ne comprend que de 3 à 3½ tours convexes à croissance assez rapide, le dernier muni d'une carène saillante le plus souvent médiane, parfois légèrement inframédiane. La taille, assez faible, ne dépasse pas 4 millimètres chez les plus grands individus. Le test est corné clair ou fauve clair, presque transparent ; il montre, en dessus, des stries longitudinales fines, serrées, subégales, médiocrement obliques, coupées de stries spirales très fines, subégales, écartées, peu nombreuses et, en dessous, des stries longitudinales plus fines coupées de stries spirales plus fortes, plus nombreuses, encore plus accentuées et plus serrées aux premiers tours. Comme chez tous les Planorbes australiens de ce groupe, la sculpture spirale est plus fortement marquée à la face inférieure qu'à la face supérieure.

Planorbis (Gyraulus) infralineatus Martens.

1867. *Planorbis infralineatus* MARTENS, *Malakozool. Blätter*, XIV, p. 213, No. 2.
 1878. *Planorbis (Nautilina) javanicus* MOUSSON, in NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 244, No. 30 (*nomen nudum*).
 1886. *Planorbis infralineatus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed. XVII, Nürnberg, p. 157, No. 139, taf. xxiii, fig. 4.

LOCALITÉ :

Iles de la Sonde : Java, sans localité précise [Collect. du Baron F. DE RICHTHOFEN ; Collect. A. MORELET] ; 30 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est encore inconnue en dehors de l'île de Java.

Coquille déprimée, subconvexe en dessus avec une portion centrale assez profondément enfoncée, à peine subconvexe en

dessous; spire composé de $3\frac{1}{2}$ -4 tours convexes à croissance régulière et assez rapide, séparés par des sutures profondes; dernier tour grand, à peu près aussi convexe en dessus qu'en dessous, à peine dilaté à l'extrémité, *comprimé en son milieu*¹; ouverture très oblique, ovulaire transverse, à bords convergents assez rapprochés réunis par une faible callosité blanche; bord supérieur dépassant notablement le columellaire; péristome intérieurement bordé, principalement à la partie inférieure, d'un épaississement blanc formant bourrelet.

Les dimensions de quelques échantillons sont données dans le tableau suivant :

Diamètre maximum.	Diamètre minimum.	Hauteur totale.	Diamètre de l'ouverture.	Hauteur de l'ouverture.
7 mill.	$5\frac{1}{2}$ mill.	2 mill.	3 mill.	$2\frac{1}{2}$ mill.
$6\frac{1}{2}$ —	$5\frac{1}{4}$ —	$1\frac{3}{4}$ —	$2\frac{3}{4}$ —	2 —
$6\frac{1}{4}$ —	$5\frac{1}{2}$ —	$1\frac{1}{2}$ —	$2\frac{1}{2}$ —	$1\frac{1}{2}$ —
6 —	5 —	$1\frac{1}{2}$ —	$2\frac{1}{4}$ —	2 —

Test relativement épais, solide, à peine translucide, variant du corné fauve au brun rougeâtre, aussi foncé en dessus qu'en dessous. Stries longitudinales fines, serrées, subégales, peu obliquement onduleuses en dessus, coupées de très rares stries spirales très fines et tout à fait irrégulièrement distribuées; en dessous, stries longitudinales très fines coupées de stries spirales peu nombreuses, très espacées, délicates et irrégulièrement distribuées.

Cette description, faite d'après les nombreux exemplaires appartenant au Musée de Calcutta étiquetés *Planorbis (Nautilina) javanicus* Mousson, correspond entièrement à celle donnée par le Dr. E. von MARTENS de son *Planorbis infralineatus* :

"Testa depressa, medio angulata, supra leviter, infra vix immersa, striatula, infra lineis subtilibus spiralibus sculpta, luteo brunnea; anfractibus $4\frac{1}{2}$ -5, sutura sat profunda distincti, modice involuti; apertura obliqua, ovata, peristomate intus albo labiato. Diam. maj. $6\frac{1}{2}$ mm. 5, alt. 2."²

L'identité de ces deux coquilles ne saurait faire de doute et le nom d'*infralineatus* étant le plus ancien doit être adopté.³ Ce Planorbe rappelle les espèces du groupe du *Planorbis (Gyraulus) saigonensis* Crosse et Fischer.

Planorbis (Gyraulus) Gilberti Dunker.

1848. *Planorbis Gilberti* DUNKER, *Proceedings Zoological Society of London*, p. 40.

¹ La coquille paraît ainsi vaguement subcarénée. On observe d'ailleurs un certain polymorphisme: chez quelques exemplaires, la compression du dernier tour, beaucoup plus accentuée, donne l'impression d'une carène submédiane très émoussée; chez d'autres, le dernier tour est presque arrondi. Les intermédiaires entre ces deux types extrêmes sont nombreux.

² MARTENS (DR. E. von). Ueber die ostasiatischen Limnaeaceen, *Malakoz. Blätter*, XIV, 1867, p. 213.

³ Le Doct. E. von MARTENS [Süss-und Brackwasser-Mollusken des Indischen

1878. *Planorbis Gilberti* SOWERBY, Monograph of the genus *Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. v. fig. 37a-37b.
 1882. *Planorbis Gilberti* TATE, *Proceedings Linnean Society New South Wales*, VI, p. 559.
 1882. *Planorbis Gilberti* SMITH, *Journal Linnean Society of London, Zoology*, XVI, p. 294, No. 101, pl. vi, fig. 30-32.
 1886. *Planorbis Gilberti* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat-Conchylien-Cabinet*, 1^e Edit., XVII, Nürnberg, p. 186, No. 178, taf. xxviii, fig. 5.

LOCALITÉ :

Australie : Burdekin River (Queensland) [Collect. G. NEVILL] ; 10 exemplaires ; No. M. $\frac{409.5}{1}$.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est spéciale à l'est australien : elle est connue des environs de Brisbane [Collect. H. CUMING, in *British Museum*, PETERD] et de Port Curtis [*Mus. Berlin.*, cf. : CLESSIN, *loc. supra cit.*, 1886, p. 186].

Coquille très déprimée, à peine subconvexe en dessus, presque plane en dessous avec une très légère indication subanguleuse entourant l'ombilic ; spire composée de 3-3½ tours, les premiers bien enfoncés, surtout en dessus, aussi convexes en dessus qu'en dessous, à croissance régulière et assez rapide ; dernier tour grand, légèrement dilaté à son extrémité, muni d'une *carène filiforme médiane* forte et aiguë ; ouverture oblique, cordiforme transverse à bords marginaux convergents et rapprochés parfois réunis par une très faible callosité blanchâtre ; bord supérieur dépassant le bord columellaire.

Diamètre maximum : 6 millimètres ; diamètre minimum : 5 millimètres ; hauteur : 1½ millimètre ; diamètre de l'ouverture : 2½ millimètres ; hauteur de l'ouverture : 2 millimètres.

Test mince, léger, transparent, corné pâle jaune clair parfois verdâtre, un peu brillant ; orné, en dessus, de stries longitudinales obliques, serrées, très fines, très inégales, coupées de rares stries spirales beaucoup plus fines, très irrégulièrement distribuées et, en dessous, de stries longitudinales encore plus fines coupées de stries spirales plus nombreuses, mieux marquées, visibles même sur les premiers tours.

G. DUNKER place la carène au dessous du milieu des tours. Tous les specimens du *Planorbis (Gyraulus) Gilberti* Dunker que j'ai examinés ont une carène médiane et je suis en cela d'accord

Archipels, in : DR. MAX WEBER, *Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien* IV, 1^{re} partie, Leiden, 1897, p. 4] avait déjà suggéré ce rapprochement : " Nevill's *Pl. javanicus* Mousson handlist Moll. Indian Museum I, p. 244 ist entweder auch diese Art [il s'agit ici du *Planorbis saigonensis* Crosse et Fischer = *Planorbis compressus* Hutton] oder noch wahrscheinlicher mein *Pl. infalinateus* Malak Blätt. 1867, p. 213, Clessin Taf. 23, fig. 4 da Nevill seine Art von Freiherrn von Richthofen in grösserer Anzahl aus Java erhielt, wie ich die ebengenannte."

avec E. A. SMITH qui, après une étude très attentive " of the three typical specimens in the Cumingian collection, I can affirm with certainty that it is central upon the upper whorls, and becomes a little subcentral upon the last, especially toward the aperture." ¹ E. A. SMITH a également observé la sculpture spirale ci-dessus décrite; il n'est pas question dans la Monographie de S. CLESSIN ²

Une espèce relativement voisine, le *Planorbis* (*Gyraulus*) *obtusus* Deshayes, ³ de taille plus grande (jusqu' à 7½ millimètres de diamètre maximum), avec, en dessous, un enroulement assez particulier ⁴ et, au dernier tour, une carène très inframédiane ⁵—presque subbasale—montre également la même sculpture, mais plus accentuée. En dessus les stries longitudinales sont plus fortes, obliques, serrées, coupées de rares stries spirales; en dessous les stries longitudinales sont coupées par des stries spirales plus nombreuses et plus fortes que chez le *Planorbis* *Gilberti* Dunker, très visibles sur les premiers tours, moins serrées et moins nombreuses au dernier tour.

§ VII.

Planorbis (*Gyraulus*) *essingtonensis* Smith.

1882. *Planorbis essingtonensis* SMITH, *Journal Linnean Society of London, Zoology*, XVI, p. 294, No. 103, pl. vi, fig. 33-35.
1886. *Planorbis essingtonensis* CLESSIN, *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *Systemat-Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 187, No. 179, taf. xxviii, fig. 3.

LOCALITÉ :

Australie : Brisbane ⁶ [Collect. J. NEVILL]; 3 exemplaires ; No. M. 4100.

¹ SMITH (E. A.), On the Freshwater Shells of Australia; *Journal Linnean Society of London, Zoology*, XVI, 6 Avril 1882, p. 295.

² CLESSIN (S.) [in: MARTINI et CHEMNITZ, *loc. supra cit.*, XVII, 1886, p. 186], ajoute que la figure donnée par G. B. SOWERBY [in: L. REEVE, *loc. supra cit.*, 1878, pl. v, fig. 37a-37b] (S. CLESSIN cite, par erreur: "Reeve Conch. Icon. fig. 32a-b," ces dernières figures se rapportent au *Planorbis natalis* Sowerby [= *Planorbis natalensis* Krauss]) montre une carène basale. La figure de REEVE est, en effet, fort peu exacte.

³ DESHAYES (G. P.), Mss. in: *Collect. H. Cuming*, in: G. B. SOWERBY, *loc. supra cit.*, XX, London, 1878, pl. v, fig. 39a-39b. SOWERBY ajoute que DESHAYES a décrit son espèce dans les *Proceedings of the Zoological Society of London* ce qui est une erreur, le *Planorbis obtusus* Deshayes étant resté manuscrit jusqu' à la publication du grand ouvrage de L. REEVE.

⁴ La spire, composée de 4½ à 5 tours, est presque plate en dessous, avec les premiers tours au fond d'une cavité ombilicale assez profonde.

⁵ E. A. SMITH (*loc. supra cit.*, 6 Avril 1882, p. 295) fait observer, avec raison, combien les figures 39a et 39b de G. B. SOWERBY [in: L. REEVE, 1878, pl. v] sont incorrectes, notamment en ce qui concerne la carène du dernier tour représentée comme *basale* et *aiguë*. En réalité cette carène est assez faible; elle est *subbasale* et quelquefois même *inframédiane* comme je l'ai indiqué ci-dessus. Il en est également ainsi chez les 4 spécimens étudiés par E. A. SMITH (*loc. supra cit.*, 6 Avril 1882, p. 295) qui sont les *cotypes* de G. P. DESHAYES (de la collection H. Cuming) actuellement conservés au *British Museum*.

⁶ Parmi de nombreux exemplaires du *Planorbis* (*Gyraulus*) *planissimus* Mousson.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est seulement connue, en dehors des environs de Brisbane, des lacs d'eau douce de Point Smith, Port Essington (Australie) [Collect. du *British Museum*, London].

Coquille très plate, légèrement subconvexe en dessus, à peine subconvexe en dessous; spire composée de 4 tours convexes à *croissance lente et régulière*¹ séparés par des sutures bien marquées; dernier tour médiocre, un peu plus convexe en dessus qu'en dessous (sauf près de l'ouverture, où il est sensiblement aussi convexe en dessus qu'en dessous) avec une carène submédiane bien marquée;² ouverture obliquement ovale transverse, à bords convergents assez éloignés réunis par une très légère callosité blanche.

Diamètre maximum: 5 millimètres; diamètre minimum: 4 millimètres; hauteur: $\frac{1}{4}$ -1 millimètre.³

Test mince, léger, subtransparent, d'un corné fauve assez coloré plus roux en dessous, orné, en dessus, de stries longitudinales fines, serrées, subégales, obliquement onduleuses, visibles même sur les premiers tours de spire et, en dessous, de stries encore plus fines et moins obliques.

Cette espèce *ne possède pas de sculpture spirale*. En cela elle se distingue très nettement du *Planorbis Gilberti* Dunker dont elle se sépare encore par son enroulement beaucoup plus lent et son ouverture plus étroite. Elle est beaucoup plus voisine d'un autre Planorbe australien, également décrit par E. A. SMITH,⁴ le *Planorbis macquariensis*;⁵ mais cette dernière espèce est moins comprimée, sa cavité ombilicale est légèrement plus profonde, la carène du dernier tour est moins accentuée et, enfin, sa taille est plus faible: $4\frac{1}{2}$ millimètres de diamètre maximum et $1\frac{1}{4}$ millimètre de hauteur. Comme le *Planorbis essingtonensis* Smith, le *Planorbis macquariensis* Smith est dépourvu de sculpture spirale.

Planorbis (Gyraulus) meridionalis Brazier.

- 1875. *Planorbis meridionalis* BRAZIER, *Proceedings Linnean Society New South Wales*, I, p. 20.
- 1876. *Planorbis tasmanicus* WOOD, *Proceedings Royal Society Tasmania* p. 79.
- 1879. *Planorbis meridionalis* BRAZIER, *Proceedings Royal Society Tasmania*, p. 72.
- 1882. *Planorbis meridionalis* TATE, *Proceedings Linnean Society New South Wales*, VI, p. 559.
- 1882. *Planorbis Tasmanicus* TATE, *Proceedings Linnean Society New South Wales*, VI, p. 559.

¹ En dessous, l'enroulement de cette coquille rappelle celui du *Planorbis (Tropidiscus) planorbis* Linné si abondamment répandu dans les eaux douces de l'Europe.

² Cette carène est, parfois, très légèrement inframédiane.

³ E. A. SMITH [On the Freshwater Shells of Australia, *Journal Linnean Society of London, Zoology*, XIV, 6 Avril 1882, p. 295] donne, pour un même diamètre maximum de 5 millimètres, $1\frac{1}{4}$ millimètre de hauteur.

⁴ SMITH (E. A.), *loc. supra cit.*, XVI, 6 Avril 1882, p. 295, No. 104, pl. vii, fig. 4-5 et 6.

⁵ Ce Planorbe habite la rivière Macquarie, en Australie (New South Wales) où il a été découvert par le REV. H. LANDSBOROUGH.

LOCALITÉ :

Tasmanie : Sans indication précise de localité [Collect. G. Nevill]; No. M. $2\frac{1}{4}$.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce paraît spéciale à la Tasmanie.

Les exemplaires du Musée d'Histoire naturelle de Calcutta sont bien typiques. Les plus grands mesurent $3\frac{1}{2}$ -4 millimètres de diamètre maximum. Leur dernier tour est grand, nettement dilaté à l'extrémité, muni d'une carène inframédiane plus ou moins accentuée mais toujours bien indiquée. L'ouverture est oblique, ovulaire transverse, avec des bords marginaux rapprochés et convergents souvent réunis par une faible callosité.

Le test est mince, subtransparent, corné fauve, souvent recouvert d'un enduit limoneux marron foncé ou noirâtre cachant plus ou moins la sculpture. Celle-ci se compose de stries longitudinales très fines, serrées, peu obliques, visibles même sur les premiers tours et plus délicates en dessus qu'en dessous. Il n'existe aucune trace de sculpture spirale.

Planorbis (Gyraulus) tondanensis Quoy et Gaimard.

- 1833. *Planorbis tondanensis* QUOY et GAIMARD, *Voyage de découvertes de l'Astrolabe*, Zoologie, II, p. 209; Atlas, pl. lviii, fig. 39.
- 1838. *Planorbis tondanensis* DE LAMARCK, *Histoire natur. Animaux sans Vertèbres*, Ed. 2 [par G. P. DESHAYES], VIII, p. 392 [non A. MOUSSON, I. REEVE].
- 1887. *Planorbis tondanensis* MARTENS, *Malakozöolog. Blätter*, XIV, p. 215, No. 4.
- 1878. *Planorbis tonganensis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 244, No. 29.
- 1886. *Planorbis Fondonensis* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 218, No. 233.
- 1897. *Planorbis tondanensis* MARTENS, *Süss- und Brackwasser-Mollusken*, in : M. WEBER, *Zoolog. Ergebnisse . . . Ost Indien*, IV, p. 14, No. 4, taf. i, fig. 23-25.
- 1897. *Planorbis tondanensis* KOBELT, *Land- und Süßwasserkonchylien [von Kükenthals Reise]*, *Abhandlung. d. Senckenberg. Naturforsch. Gesellschaft Frankfurt a. M.*, XXIV, p. 82, taf. xi, fig. 3.

LOCALITÉ :

Malaisie : Lac Tondano, dans le Minahassa, au nord de l'île Célèbe [Collect. TEYSMAN, DR. F. STOLICZKA].

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est seulement connue de la localité originale où elle fut découverte par HOMBRON et JACQUINOT : le lac Tondano, dans l'île Célèbe.

* Le Muséum d'Histoire naturelle de Paris possède le type de QUOY et GAIMARD, recueilli par HOMBRON et JACQUINOT (Expédition d'URVILLE, 1829). En voici la description :

Coquille subconvexe en dessus (tours embryonnaires profondément enfoncés), très légèrement subconvexe en dessous avec cavité ombilicale étroite et assez profonde (premiers tours très petits, profondément enfoncés); spire composée de 3 tours convexes à croissance extrêmement rapide, séparés par des sutures profondes; dernier tour très grand, formant presque toute la coquille, extrêmement dilaté à l'extrémité, comprimé mais non caréné en son milieu; ouverture oblique, ovulaire transverse, à bords convergents et rapprochés réunis par une forte callosité blanche; péristome épaissi, bordé intérieurement, à sa partie inférieure, d'un bourrelet blanchâtre.

Diamètre maximum: $6\frac{1}{2}$ millimètres; diamètre minimum: $4\frac{1}{2}$ millimètres; hauteur: 2 millimètres; diamètre de l'ouverture: $2\frac{1}{2}$ millimètres; hauteur de l'ouverture: 2 millimètres.

Test relativement épais, solide, non transparent, marron fauve un peu brillant, plus foncé en dessus; stries longitudinales fines, serrées et médiocrement obliques en dessus, plus fines et plus serrées en dessous.

J'ai également vu des exemplaires bien typiques, mais de taille plus faible (diamètre maximum: $5-5\frac{1}{2}$ millimètres) et à test plus clair et un peu moins solide provenant de Célèbes, mais sans indication précise de localité. Chez l'un d'eux le dernier tour est presque franchement caréné.

Les spécimens appartenant au Museum d'Histoire naturelle de Calcutta sont de bien plus petite taille: $4-4\frac{1}{2}$ millimètres de diamètre maximum. Ils sont, proportionnellement, moins aplatis et leur test est un peu plus léger. Leur dernier tour, seulement comprimé, est également très dilaté à l'extrémité; enfin leur ouverture, oblique, bien ovulaire transverse, parfois un peu descendante, a les bords rapprochés et très convergents réunis par une assez forte callosité blanche.

Le DR. E. von MARTENS¹ donne, à cette espèce, $2\frac{1}{2}$ millimètres de diamètre maximum, 2 millimètres de diamètre minimum et 1 millimètre de hauteur. Je n'ai jamais observé d'individus d'aussi faibles dimensions.²

Tous les exemplaires que j'ai examinés sont entièrement dépourvus de sculpture spirale.

§. VIII.

Planorbis (Gyraulus) singularis Mousson.

Pl. IV, fig. 12, 15 et 16.

1869. *Planorbis singularis* MOUSSON, *Catal. Mus. Godefroy*, IV, p. 69.

1878. *Planorbis singularis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 247, No. 57.

¹ MARTENS (DR. E. von), Ueber die ostasiatischen Limnaeaceen, *Malakozoolog. Blätter*, XIV, 1867, p. 215.

² Par ailleurs la description de DR. E. von MARTENS est exacte. Elle a été reproduite par S. CLESSIN dans sa Monographie (1886, p. 218).

1886. *Planorbis singularis* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 149, No. 129, taf. xxi, fig. 6.

LOCALITÉ :

Archipel des Fidji : île Ovalau, à l'est de l'île Viti (Exemplaires provenant du *Musée Godefroy*) ; 2 échantillons ; No. 3.227.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe n'est jusqu'ici connu qu'à l'île Ovalau.

Coquille très petite, convexe en dessus, subconvexe en dessous ; spire composée de 3 tours convexes, les premiers profondément enfoncés en dessus, à croissance rapide mais régulière, séparés par des sutures bien marquées ; dernier tour grand, arrondi — mais avec une très faible angulosité en dessus et en dessous entourant la cavité ombilicale — aussi convexe en dessus qu'en dessous, un peu dilaté à l'extrémité ; ouverture oblique, ovale transverse, à bords convergents et rapprochés, le supérieur dépassant beaucoup le columellaire.

Diamètre maximum : $1\frac{1}{4}$ millimètre ; diamètre minimum : 1 millimètre ; hauteur : $\frac{1}{2}$ millimètre. •

Test mince, fragile, corné roux sur les premiers tours, corné blond sur le dernier ; stries longitudinales relativement fortes, subélevées, obliquement onduleuses, serrées, subégales, sensiblement aussi développées en dessus qu'en dessous, sans trace de sculpture spirale.

§. IX.

Planorbis (Gyraulus) Montrouzieri Gassies.

Pl. II, fig. 7-8-9.

1863. *Planorbis Montrouzieri* GASSIES, *Faune Conchyliol. Nouvelle-Calédonie*, I, p. 79, No. 74, pl. vii, fig. 17.
 1871. *Planorbis Montrouzieri* GASSIES, *loc. supra cit.*, II, p. 139, No. 188.
 1894. *Planorbis (Spirodiscus) Montrouzieri* CROSSE, *Journal de Conchyliologie*, XLII, No. 334, No. 207 et p. 462, No. 153.
 1908. *Planorbis Montrouzieri* BAVAY, *Mollusques terr. fluviat. ; Nova Guinea, Expedit. scientif. Neerlandaise Nouvelle-Guinée*, V, *Zoologie*, Leiden, p. 289, No. 4.

LOCALITÉ :

Nouvelle-Calédonie : sans indication précise ; No. 120B.

DISTRIBUTION GÉOGRAPHIQUE.

Découverte dans les marais de Kanala [R. P. MONTROUZIER], cette espèce a été longtemps connue seulement de la Nouvelle-Calédonie. Elle a été retrouvée depuis en Nouvelle-Guinée par M. DE BEAUFORT [cf. : A. BAVAY, *loc. supra cit.*, 1908, p. 289].

Le Muséum National d'Histoire naturelle de Paris possède un cotype de cette espèce recueilli, en 1877, par l'abbé LAMBERT Il présente les caractères suivants :

Coquille subconvexe en dessus, presque plane et assez largement ombiliquée en dessous ; spire composée de $4\frac{1}{2}$ tours convexes à croissance rapide, séparés par des sutures profondes et comme canaliculées ; dernier tour grand, plus convexe en dessus qu'en dessous, légèrement dilaté à son extrémité muni d'une carène un peu inframédiane bien marquée ; ouverture oblique, cordiforme transverse, anguleuse extérieurement, à bords rapprochés et convergents, le supérieur dépassant notablement le columellaire.

Diamètre maximum : $4\frac{1}{2}$ millimètres ; diamètre minimum : 4 millimètres ; hauteur : $1\frac{1}{2}$ millimètre ; diamètre de l'ouverture : $1\frac{1}{2}$ millimètre ; hauteur de l'ouverture : 1 millimètre.

Test mince, à peu près transparent, jaune corné un peu brillant, orné de stries longitudinales fines, serrées, inégales, obliquement onduleuses, plus fines et beaucoup moins obliques en dessous.

Dans la description originale de cette espèce, J. B. GASSIES donne des dimensions notablement plus grandes : 6 millimètres de diamètre maximum, 4 millimètres de diamètre minimum et 3 millimètres de hauteur. Il ajoute que cette coquille est de "couleur de corne pâle, un peu rouille, luisante, mais recouverte toujours d'un limon ferrugineux brun noir passant au roussâtre..." ; que la spire est composée de $4\frac{1}{2}$ tours à croissance rapide, le dernier caréné, formant le tiers de la totalité ; enfin que cette espèce est "très voisine du *Planorbis imbricatus* Müller, surtout ne cette variété *B. major*, que j'ai signalée dans mon Tableau des Mollusques terrestres et d'eau douce de l'Agenais."¹ Aussi ne comprend-on guère comment H. CROSSE² a pu écrire, à propos du *Planorbis Montrouzieri* GASSIES : "Espèce à tours arrondis, comme la précédente..."³ et classer ce Planorbe dans le sous-genre *Spirodiscus* Stein,⁴ c'est-à-dire dans le groupe du *Planorbis* (*Planorbis*) *corneus* Linné.

Les specimens du Musée de Calcutta ont, comparés au type précédemment décrit, une spire à croissance plus rapide, le dernier tour étant, proportionnellement, un peu plus grand et mieux dilaté à l'extrémité. Ce dernier tour est également muni d'une carène inframédiane, mais elle est légèrement plus saillante. Le test, un peu plus foncé, présente la même sculpture.

¹ GASSIES (J. B.), Faune Conchyliologique terr. et fluviolacustre de la Nouvelle-Calédonie ; *Actes Société linnéenne Bordeaux*, XXIV (3^e série IV), 1863, p. 283 (à part, p. 79).

² CROSSE (H.), Faune Malacologique terr. et fluviat. Nouvelle Calédonie et dépendances, *Journal de Conchyliologie*, 1894, p. 335.

³ Il s'agit du *Planorbis ingenuus* Morelet [*Bulletin société Hist. natur. Moselle*, 2 Avril 1857, p. 1 ; figuré par J. B. GASSIES, *loc. supra cit.*, IV, 1863, p. 282 (à part, p. 78) et par S. CLESSIN, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1886, p. 206. No. 208, taf. xxxi, fig. 4], espèce de grande taille (15,5 millimètres de diamètre maximum et 4,5 millimètres de hauteur) à tours parfaitement arrondis et rappelant, en effet, les espèces du s. g. *Planorbis* sensu stricto [= *Spirodiscus* Stein (part)].

⁴ STEIN (J. P. E. F.), *Die lebenden Schnecken und Muscheln der Umgegend Berlins*, Berlin, 1850, p. 73.

Planorbis (Gyraulus) Rossiteri Crosse.

1871. *Planorbis Rossiteri* CROSSE, *Journal de Conchyliologie*, XIX, p. 204.
 1880. *Planorbis Rossiteri* GASSIES, *Faune Conchyliol. Nouvelle-Calédonie*, III, p. 76, pl. i, fig. 25.
 1880. *Planorbis Fabrei* GASSIES, *loc. supra cit.*, III, p. 104.
 1880. *Planorbis Rossiteri* CROSSE, *Journal de Conchyliologie*, XXVIII, p. 142, No. 1, pl. iv, fig. 4.
 1886. *Planorbis Rossiteri* CRESSIN, *Die Familie der Limnaeiden*, in: MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 135, No. 110, taf. xxi, fig. 4.
 1894. *Planorbis (Tropidiscus) Rossiteri* CROSSE, *Journal de Conchyliologie*, XLII, p. 335, No. 208, et p. 470, No. 8.

LOCALITÉ :

Nouvelle-Calédonie : sans indication précise de localité.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe n'est connu que de la Nouvelle-Calédonie et de quelques îles de l'Archipel des Loyalty (notamment de l'île Maré [R. ROSSITER]).

Certainement très voisine du *Planorbis Montrouzieri* Gassies, cette espèce possède, dit H. CROSSE, un "dernier tour muni, à la périphérie, d'une carène aiguë."¹ L'examen des exemplaires appartenant au Musée de Calcutta montre que cette carène est assez variable. De position inframédiane dans tous les individus étudiés, elle est plus ou moins saillante et devient parfois presque obsolette. Ces derniers échantillons restent rares et sont reliés au type à carène aiguë par tous les intermédiaires. L'ouverture est obliquement subcordiforme, à bords bien convergents² et très rapprochés généralement réunis par une faible callosité blanchâtre.² Le bord supérieur de l'ouverture dépasse toujours très notablement le bord inférieur.

Le test est mince, léger, absolument transparent, d'un corné pâle très clair. Il est orné, en dessus, de stries longitudinales fines, serrées, subégales, presque équidistantes et médiocrement obliques, en dessous de stries longitudinales également serrées et régulières, mais beaucoup plus fines et moins obliques.

C'est certainement par erreur que J. B. GASSIES, après avoir décrit cette espèce dans sa "*Faune Conchyliologique de la Nouvelle Calédonie*" [fasc. III, 1880, p. 76], lui a imposé, à l'explication des planches (p. 104), le nouveau nom de *Planorbis Fabrei*.

¹ CROSSE (H.), *Faune malacologique terr. et fluviat. Nouvelle Calédonie et dépendances*, *Journal de Conchyliologie*, XLII, 1894, p. 335.

² L'ouverture est quelque peu variable : elle passe insensiblement à la forme ovulaire allongée.

Sous-Genre *Torquis* Dall, 1905.

1905. *Torquis* DALL, Land and Freshwater Mollusks Alaska, *Harriman Alaska Expedition*, XIII, New-York, p. 83 et p. 86.

Coquille petite, bien déprimée surtout en dessus ; spire composée d'un petit nombre de tours à croissance rapide, le dernier grand, caréné ; sculpture formée seulement de stries longitudinales.

Type: *Planorbis parvus* Say.

Les espèces du sous-genre *Torquis* vivent dans l'Amérique du Nord où elles remplacent, en grande partie, les *Gyraulus*. Les deux sous-genres sont très voisins et le premier diffère du second par sa spire à enroulement plus rapide, par ses tours mieux arrondis mais surtout par son test dépourvu de sculpture spirale.

Planorbis (*Torquis*) *parvus* Say.

1817. *Planorbis parvus* SAY, *Nicholson's Encycloped.*, 1^{re} Edit. (non paginée), II, pl. i, fig. 5.
 1840. *Planorbis elevatus* C. B. ADAMS [*Planorbis juv.*], *Boston Journal Natur. History*, III, p. 327, pl. ii, fig. 16.
 1841. *Planorbis elevatus* GOULD, *Report on the Invertebrate of Massachusetts*, p. 207.
 1841. *Planorbis parvus* GOULD, *loc. supra cit.*, p. 209, fig. 139.
 1843. *Planorbis parvus* DE KAY, *Zoology of New-York*, part v, *Mollusca*, p. 63, pl. iv, fig. 58.
 1843. *Planorbis elevatus* DE KAY, *loc. supra cit.*, part v, p. 65.
 1844. *Planorbis parvus* HALDEMAN, *Monograph of the Limniades and other Univalve Shells*, p. 27, pl. iv, fig. 19-23.
 1865. *Planorbis concavus* ANTHONY, *Catal. of Shells of Cincinnati (sine descript.)*.
 1865. *Planorbis parvus* BINNEY, *Land and Freshwater Shells North Amer.* II, p. 133, fig. 222-223.
 1878. *Planorbis parvus* SOWERBY, *Monograph of the Genus Planorbis*, in : J. REEVE, *Conchologia Iconica*, XX, London, pl. xi, fig. 87.
 1878. *Planorbis elevatus* SOWERBY, *loc. supra cit.*, XX, pl. xiii, fig. 109.
 1878. *Planorbis (Nautilina) parvus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 243, No. 25.
 1886. *Planorbis parvus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet.*, 2^e Edit., Nürnberg, p. 133, No. 107, taf xxi, fig. 1.
 1891. *Planorbis parvus* PILSBRY, *Proceed. Academy Natural Sciences Philadelphia*, p. 322.
 1899. *Planorbis (Gyraulus) parvus* MARTENS, *Land and Freshwater Mollusca (Biologia Central-Americana)*, p. 394, No. 14 et p. 644.
 1905. *Planorbis (Torquis) parvus* DALL, *Land and Freshwater Mollusks of Alaska*, p. 95.
 1905. *Planorbis billingsi* LEA 1860 [d'après les types de LEA], DALL, *loc. supra cit.*, p. 95.

LOCALITÉ :

Etats-Unis : New-York [Prof. W. NEWCOMB ; W. A. BROWN] ; 40 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe est très répandu dans l'Amérique du Nord (région Est), depuis la Floride jusqu' au 67° de latitude nord environ. Il vit également dans le bassin du Yukon (Alaska). H.

A. PILSBRY l'a signalé dans l'état de Morelos (Mexique central) où il a été recueilli par A. HEILPRIN.¹

La coquille du *Planorbis (Torquis) parvus* Say rappelle celle du *Planorbis (Gyraulus) limophilus* Westerlund² des régions centrales et septentrionales de l'Europe ;³ mais cette dernière espèce possède un test brillant, d'un corné rougeâtre, orné de stries longitudinales fines coupées de très fines stries spirales, tandis que le test du Planorbe américain est seulement garni de stries longitudinales fines et serrées.

Planorbis (Torquis) vermicularis Gould.

- 1847. *Planorbis vermicularis* GOULD, *Proceed. Boston Society Natur. History*, II, p. 212.
- 1852. *Planorbis vermicularis* GOULD, *Moll. Unit. St. Explor. Expedit.*, p. 112, fig. 131, 131a et 131b.
- 1865. *Planorbis vermicularis* BINNEY, *Land and Freshwater Shells of North America*, II, p. 128, fig. 214.
- 1878. *Planorbis vermicularis* SOWERBY, *Monograph of the Genus Planorbis*, in : L. REVE, *Conchologia Iconica*, London, XX, pl. xii, fig. 104a-104b.
- 1878. *Planorbis (Nautilina) vermicularis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 244, No. 33.
- 1886. *Planorbis vermicularis* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 114, No. 80, taf. xviii, fig. 1.
- 1905. *Planorbis (Torquis) vermicularis* DALI, *Land and Freshwater Mollusks of Alaska*, p. 95, fig. 75.

LOCALITÉ :

Etats-Unis : Californie, sans indication précise de localité [Prof. W. NEWCOMB] ; 8 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

L'aire de dispersion de ce Planorbe est relativement limitée ; on ne le rencontre, en effet, que dans les régions de l'est : aux États-Unis dans les territoires de la Californie (partie nord seulement) et de l'Orégon ; au Canada dans la Colombie britannique et l'île de Vancouver.

Le *Planorbis (Torquis) vermicularis* Gould ressemble beaucoup au *Planorbis (Torquis) parvus* Say ; il se distingue de cette der-

¹ PILSBRY (H. A.), *Proceedings Academy Natural Sciences of Philadelphia* 1891, p. 322.

² WESTERLUND (C. A.), *Beschreib. und Kritik neue Moll.*, *Malakozoolog. Blätter*, XIV, 1867, p. 204 ; = *Exposé critique Mollusques terr. eau douce Suède et Norvège*. Upsal, 1871, p. 134, No. 10 ; = *Malakozoologische Studien, Kritiken und Notizen*, X, *Malakozoolog. Blätter*, XXII, 1875, p. 113, No. 17, taf. iv, fig. 16 à 18 ; = *Fauna der paläarkt. region Binnenconchylien*, V, 1885, p. 81, No. 39 ; = CLESSIN (S.) *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1886, p. 99. [*Planorbis albus*, var. 7 : *limophilus*].

³ Le *Planorbis limophilus* Westerlund a été signalé en Allemagne dans le Tyrol ; en Norvège [C. A. WESTERLUND] et en Suède [V. LILLJEBORG, C. A. WESTERLUND].

nière espèce par sa face inférieure plus profondément ombiliquée ; son ouverture plus large, un peu épanouie ; son dernier tour proportionnellement plus développé, mieux élargi à l'extrémité. Les plus grands individus appartenant au Musée de Calcutta mesurent $4\frac{1}{2}$ millimètres de diamètre maximum, $3\frac{1}{2}$ millimètres de diamètre minimum et 1 millimètre de hauteur. Leur test est corné clair, subtransparent, souvent recouvert d'un enduit brun foncé, presque noir. En dessus les stries longitudinales sont fines, serrées, subégales et obliquement onduleuses ; elles sont plus fines en dessous, sauf au voisinage de l'ouverture où elles deviennent plus serrées et notablement plus saillantes.

Planorbis (Torquis) decipiens Adams.

1886. *Planorbis (Torquis) decipiens* ADAMS, in : CLESSIN, Die Familie der Limnaeiden, in ; MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 210, No. 215. taf. xxxii, fig. 5.

LOCALITÉS :

Antilles : Saint Thomas ; No. M. 4116 ; = Cuba, sans indication plus précise ; 2 exemplaires ; No. 99.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe est seulement connu des îles de Saint Thomas [Collect. S. CLESSIN], de la Jamaïque [Collect. DR. W. DUNKER] et de Cuba [Collect. du MUSÉE DE CALCUTTA].

Coquille de petite taille, légèrement subconvexe en dessus avec une région centrale concave, bien concave en dessous ; spire composée de 3 à 4 tours subconvexes à croissance rapide mais régulière ; sutures profondes ; dernier tour très grand égalant, dans le dernier quart de son développement, environ le tiers du diamètre total de la coquille, sensiblement aussi convexe en dessus qu'en dessous, avec en dessus une indication carénale à peu de distance de la suture et, en dessous, une indication carénale mieux marquée également voisine de la suture¹ ; ouverture oblique, semi-lunaire, le bord supérieur de l'ouverture très descendant ; bords marginaux écartés, peu convergents, réunis par une callosité faible et blanchâtre.

Diamètre maximum : 5-6 millimètres ; hauteur : $2-2\frac{1}{2}$ millimètres.

Test mince, assez fragile, presque transparent, corné très clair, avec en dessus des stries longitudinales très obliques, subcostulées, onduleuses, inégales et, en dessous, la même sculpture un peu moins accentuée, plus régulière, les stries étant—sauf au

¹ A part le coloris beaucoup trop foncé, la figure de cette espèce donnée par S. CLESSIN (*loc. supra cit.*, 1886, taf. xxxii, fig. 5) est très exacte. Dans la vue du dessous de la coquille, l'indication carénale des derniers tours est parfaitement rendue. Par contre, le schéma de la coquille, vue du côté de l'ouverture, est moins bon et le bord supérieur de l'ouverture n'est pas assez descendant.

voisinage de l'ouverture—moins obliquement onduleuses et visibles jusqu' au fond de la cavité ombilicale.¹

Sous-genre *Armiger* Hartmann, 1840.

- 1840. *Armiger* HARTMANN, *Systematische Übersicht der Europäischen Gattungen* (Tableau paru, en 1840, avec la 1^{re} livraison de l'ouvrage ci-dessous mentionné : HARTMANN, 1844).
- 1844. *Armiger* HARTMANN, *Erd-und Süßwasser-Gasteropoden d. Schweiz*, St. Gallen, V, p. 172 (note infra paginale).
- 1850. *Nautilina* (part) STEIN, *Die lebenden Schnecken und Muscheln d. Umgegend Berlins*, Berlin, p. 80.
- 1885. *Armiger* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 83, No. 5.
- 1902. *Armiger* WESTERLUND, *Acta Acad. sc. Slav. merid. Zagrabiae*, CII, p. 121.
- 1903. *Spiniformis* GERMAIN, *Mollusques terr. fluvial. vivants environs Angers départ. Maine-et-Loire* (*Bulletin soc. sciences natur. Ouest France*), part I, p. 204.
- 1905. *Armiger* DALL, *Land and Freshwater Mollusks Alaska, Harriman Alaska Expedition*, Vol. XIII, New-York, p. 83 et p. 86.

Coquille très petite, sublenticulaire ; spire composée d'un très petit nombre de tours ($2\frac{1}{2}$ – $3\frac{1}{2}$) à croissance très rapide, le dernier grand, fortement caréné, garni de côtes lamelleuses et espacées faisant saillie à la périphérie ; ouverture subcordiforme, entourée d'un péristome subcontinu.

Type : *Planorbis crista* Linné.

Le sous-genre *Armiger* ne contient qu'un très petit nombre de forts petits Planorbes vivant au milieu des plantes aquatiques où ils ne sont jamais bien fréquents. Les représentants de ce sous-genre vivent dans la plus grande partie du système paléarctique.

Planorbis (*Armiger*) *crista* Linné.

- 1758. *Nautilus crista* LINNÉ, *Systema Naturae*, Ed. X, I, p. 799.
- 1805. *Planorbis cristatus* DRAPARNAUD, *Histoire Mollusques France*, p. 44, pl. ii, fig. 1–3.
- 1850. *Planorbis imbricatus* var. *cristatus* GERSTFELDT, *Moll. Sibérie*, p. 543.
- 1851. *Planorbis nautilius* DUPUY, *Histoire Mollusques terr. fluvial. France*, p. 436, pl. xxi, fig. 12.
- 1855. *Planorbis nautilius* var. *crista* MOQUIN-TANDON, *Histoire Mollusques ter. fluvial. France*, II, p. 438, pl. xxi, fig. 6 à 10.
- 1864. *Planorbis cristatus* BOURGUIGNAT, *Malacologie terr. et fluvial. Algérie*, II, p. 164, pl. x, fig. 14 à 17.
- 1871. *Planorbis crista* WESTERLUND, *Exposé critique Mollusques terr. eau douce Suède et Norvège*, p. 136.
- 1875. *Planorbis crista* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 115, No. 21, taf. iv, fig. 25 à 27.
- 1878. *Planorbis nautilius* SOWERBY, *Monograph of the genus Planor-*

¹ Les exemplaires provenant de l'île de Cuba [Musée de Calcutta, No. 99] sont bien typiques, mais ils sont d'un corné un peu moins clair et d'une taille légèrement plus petite : le plus grand mesure 5 millimètres et le plus petit $4\frac{1}{2}$ millimètres de diamètre maximum.

- bis, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. ii, fig. 8.
1878. *Planorbis (Armiger) crista* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 247, No. 56.
1882. *Planorbis nautilius* LOCARD, *Prodrôme, Catalogue Mollusques terr. fluviat. France*, p. 190.
1885. *Planorbis crista* WESTERLUND, *Fauna paläarct. region Binnenconchylien*, V, p. 83, No. 47.
1886. *Planorbis nautilus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed., XVII, Nürnberg, p. 151, No. 132, taf. xxi, fig. 3, 5 et 7.
1903. *Planorbis cristatus* LOCARD, *Coquilles fluviatiles France*, p. 61, fig. 53.
1903. *Planorbis crista* WOODWARD, *Brit. Nonmarine Moll., Journal of Conchology*, X, p. 355.
1905. *Planorbis (Armiger) crista* DALL, *Land and Freshwater Mollusks of Alaska*, p. 96.
1903. *Planorbis (Armiger) cristatus* GERMAIN, *Mollusques France et régions voisines*, p. 259, fig. 303-304.

LOCALITÉS :

Angleterre : Sans indication précise de localité [G. NEVILL] ; 15 exemplaires.

France : Environs de Marseille (Bouches-du-Rhône) ; = Environs de Bayonne (Basses-Pyrénées) ; No. 117B.

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis (Armiger) crista* Linné vit dans toute l'Europe, jusque vers les 61°-62 de latitude Nord,¹ mais il n'est jamais très commun et semble toujours plus rare dans les régions méridionales. Il habite également le Nord de l'Asie, notamment la Sibérie [G. GERSTFELDT²]. En Afrique, il a été signalé³ en Algérie,⁴ mais il paraît manquer au Maroc⁵ et en Tunisie⁶. Enfin, en Amérique, cette même espèce a été découverte en diverses localités du Canada (notamment Hamilton et Ottawa) et des États-Unis (États de Maine, Michigan, Manitoba) [W. H. DALL.⁷]

¹ Il semble très rare dans l'Europe oriento-méridionale. Il n'est signalé ni en Grèce, par C. A. WESTERLUND et H. BLANC (*1 perçu faune malacologique Grèce, inclus Epire et Thessalie*, Naples, 1879) ni au Montenegro et en Albanie par OTTO WOHLBEREDT (*Zur Fauna Montenegro und Nordalbanien, Wissenschaft. Mitteil. aus Bosnien und der Herzegowina*, Wien, XI, 1900), ni en Bulgarie par OTTO WOHLBEREDT également (*Molluskenfauna von Bulgarien, Abhandlungen der Naturforsch. Gesellsch. in Götting, XXVII, 1911*).

² GERSTFELDT (G.), *Mollusques Sibérie*, 1850, p. 543.

³ BOURGUIGNAT (J. R.) *Malacologie terr. et fluviat. de l'Algérie*, II, 1864, p. 162. Cet auteur cite deux variétés : *Planorbis imbricatus* variété *convexusculus* BOURGUIGNAT, loc. supra cit., 1864, p. 162 ; et *Planorbis imbricatus* variété *djelfensis* BOURGUIGNAT, loc. supra cit., II, 1864, p. 162.

⁴ Cette espèce manque, en effet, dans le recensement des Mollusques marocains donné par P. PALLARY, quatrième Contribution à l'étude de la faune malacologique du Maroc, *Journal de Conchyliologie*, LII, 1904 (*Planorbis* à la page 54).

⁵ Cette espèce n'est pas citée dans le travail de A. LETOURNEUX et J. R. BOURGUIGNAT : *Prodrôme de la Malacologie terrestre et fluviatile de la Tunisie*, Paris Imprimerie nationale, 1887.

⁶ DALL (W. H.), *Land and Freshwater Mollusks of Alaska*, New-York, 1905, p. 97.

Les exemplaires de Marseille (France) appartenant au Musée de Calcutta sont de petite taille ; leur test, entièrement transparent, est d'un corné blond, garni de lamelles épidermiques bien saillantes. Ces lamelles, qui atteignent leur maximum de développement dans la variété *spinulosus* Clessin¹ s'atténuent peu à peu à mesure que la coquille avance en âge : lorsque celle-ci est parfaitement adulte, ces lamelles sont beaucoup moins saillantes et l'animal correspond au *Planorbis nautilus* Linné² [= *Planorbis imbricatus* de la plupart des auteurs européens] que l'on doit considérer comme la *forme adulte* du *Planorbis crista* Linné.

Planorbis (Armiger) Annandalei Germain.

Pl. III, fig. 1-2 et 3.

1878. *Planorbis (Armiger) nautilus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 247, No. 55 [excl. syn. *Planorbis crista* L., var.].
 1878. *Planorbis (Armiger) nautilus* NEVILL, *Scientific Results Second Yarkand Mission, Mollusca*, Calcutta, p. 11, No. 25 [excl. syn.].
 1918. *Planorbis (Armiger) Annandalei* GERMAIN, *Bulletin Muséum Hist. natur*, Paris, XXIV, No. 4, p. 282, pl. v, fig. 2-3-4.

LOCALITÉ :

Asie Orientale : Le Yarkand, sans indication précise de localité [DR. F. STOLICZKA] ; 4 exemplaires.

Coquille très petite, subdéprimée, subconvexe en dessus et en dessous, largement et profondément ombiliquée ; spire composée de 3 tours bien plus convexes³ en dessous qu'en dessus, à croissance rapide, séparés par des sutures profondes ; dernier tour très grand, bien plus convexe en dessous qu'en dessus, dilaté et sub descendant à l'extrémité, comprimé mais non caréné à sa partie supérieure ; ouverture bien oblique, irrégulièrement subovale transverse—presque subquadrangulaire—; bord supérieur subarqué dans une direction très peu descendante, formant un angle marqué à sa rencontre avec le bord externe ; bords marginaux

¹ CLESSIN (S.), *Regensburg Corresp. Blätt. Mineral Zoolog. Vereins*, 1873, p. 121 (*Planorbis nautilus* variété *spinulosus*) ; et : *loc. supra cit.*, 1886, p. 153, taf. XXI, fig. 7 [= *Planorbis crista* Linné, a *cristatus* Draparnand, variété a WESTERLUND, *Exposé critique Mollusques terr. eau douce Suède Norvège*, Upsal, 1871, p. 137 ; et : *Fauna Mollusc. Suec. Norveg. et Daniae*, 1873, p. 400 ; = *Planorbis crista* variété *spinulosus* WESTERLUND, *Fauna der paläarkt. region Binnenconchylien*, V, 1885, p. 84].

² LINNÉ (C.), *Systema Naturae*, Ed. XII, II, 1767, p. 1241 (*Turbo nautilus*) [= *Planorbis imbricatus* MÜLLER, *Vermium terrest. et. fluviat. Histor.*, II, 1774, p. 165, No. 361 ; = *Helix nautilus* WALKER et BOYS, *Test. minut. rar.*, London, 1784, fig. 20-21 ; = *Planorbis nautilus* variété a *imbricatus* MOQUIN-TANDON, *Histoire Mollusques terr. et fluviat. France*, II, 1856, p. 438, pl. xxxi, fig. 11 ; *Planorbis crista* variété b *nautilus* WESTERLUND, *Malakozoolog. Blätter*, XXII, 1875, p. 115, taf. IV, fig. 28 à 30 ; = *Planorbis nautilus* variété *imbricatus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, 1886, p. 152, taf. xxi, fig. 3].

³ Les premiers tours sont très profondément enfoncés et comme tordus.

réunis par une forte callosité brun clair rendant le péristome continu ; bord supérieur dépassant le columellaire.

Diamètre maximum : $1\frac{1}{2}$ –2 millimètres ; diamètre minimum : $1\frac{1}{4}$ – $1\frac{3}{4}$ millimètres ; hauteur maximum ; $\frac{1}{2}$ millimètre.

Test mince, corné clair peu transparent, orné, en dessous, de lamelles épidermiques peu saillantes, obliquement onduleuses et assez serrées, très obsolètes et à peine visibles sur les premiers tours, et, en dessus, de lamelles épidermiques plus saillantes, très fortement obliques et onduleuses sur le milieu du dernier tour,¹ très distantes, moins saillantes et plus serrées vers l'ouverture, peu accusées sur les premiers tours ; stries longitudinales très fines et peu nombreuses, en dessus et en dessous, entre les costules.

Ce Planorbe a été découvert par G. NEVILL à l'intérieur de l'ouverture des Limnées recueillies au Yarkand par le Doct. F. STOLICZKA. G. NEVILL n'a pas, sans hésitation, rapporté cette coquille à son *Planorbis (Armiger) nautilus* puisqu'il dit que cette "... form is most certainly specifically distinct from my English specimens of *P. cristata* L., as represented in "Malak. Blätt." fig. 25–27²..."³ De fait, si le *Planorbis (Armiger) Annandalei* Germain représente, dans l'Asie Centrale, le *Planorbis (Armiger) cristatus* Linné⁴ d'Europe, il en est très distinct, non seulement par sa taille plus petite et ses caractères sculpturaux, mais encore par sa forme et le mode d'enroulement de ses tours de spire et par les particularités de son ouverture.

Sous-genre *Menetus* H. et A. Adams, 1855.

- 1855. *Menetus* H. et A. ADAMS, *Genera of recent Mollusca*, II, p. 262 [non CHENU, 1869 ; —P. FISCHER, 1883 ; —C. A. WESTERLUND, 1885, —E. von MARTENS, Avril 1899].
- 1865. *Menetus* BINNEY, *Land and Fresh water Shells of North America*, II, p. 125
- 1870. *Menetus* DALL, *Annals of Lyceum of Natural History of New-York*, IX, p. 351.
- 1886. *Menetus* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 33, No. 6.
- 1905. *Menetus* DALL, *Land and Freshwater Mollusks of Alaska*, New-York, p. 82 [excl. syn. *Heterodiscus* WESTERLUND] et p. 86.

Coquille petite, sublenticulaire déprimée ; spire composée d'un petit nombre de tours à croissance rapide ; dernier tour grand, non embrassant, bien caréné ; ouverture subcordiforme transverse ; test avec une sculpture spirale plus ou moins accentuée, rarement absente.

¹ C'est sur le milieu du dernier tour que les lamelles épidermiques atteignent leur maximum de saillie.

² Il s'agit ici de la planche IV, figures 25 à 27, du travail de C. A. WESTERLUND [Malakozoologische Studien, Kritiken und Notizen, *Malakozoolog. Blätter*, Cassel, XXII, 1875]

³ NEVILL (G.), *Scientific Results of the Second Yarkand Mission, Mollusca*, Calcutta, 1878, p. 11.

⁴ V. ante, p. 153, de ce Mémoire.

Type : *Planorbis opercularis* Gould.

Toutes les espèces appartenant au sous-genre *Menetus* vivent dans l'Amérique du Nord.

Planorbis (Menetus) opercularis Gould.

- 1847. *Planorbis opercularis* GOULD, *Proceed. Boston Society Natur. History*, II, p. 212.
- 1852. *Planorbis opercularis* GOULD, *Moll. United States Explor. Exped.*, p. 113 ; *Atlas*, fig. 132, 132a et 132b.
- 1859. *Planorbis planatus* COOPER, *Report Natur. Hist. Washington Territory*, p. 378
- 1865. *Planorbis opercularis* BINNEY, *Land and Freshwater Shells North Amer.*, part II, p. 125, fig. 208.
- 1878. *Planorbis (Menetus) opercularis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 242, No. 16.
- 1895. *Planorbis calliogyptus* VANATTA, *The Nautilus*, IX, p. 54.
- 1905. *Planorbis (Menetus) opercularis* DALL, *Land and Fresh water Mollusks of Alaska*, p. 92, fig. 71.
- 1918. *Planorbis opercularis* (et var. *multilineatus* Vanatta) BRYANT WALKER, *Synopsis ... Fresh Water Mollusca North America*, etc. . . . , *University of Michigan, Miscellaneous Publications* No. 6, Michigan, p. 101.

LOCALITÉ.

Etats-Unis : Californie [Prof. W. NEWCOMB] ; 5 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce habite l'Amérique du Nord à l'Ouest des montagnes Rocheuses, depuis la Californie jusqu'à l'Alaska. Elle est très abondante, notamment, dans la région de San Francisco. Elle représente, sur le versant pacifique, le *Planorbis exacutus* Say du versant atlantique.

Le *Planorbis planulatus* Cooper n'est qu'une variété mieux déprimée en dessus.¹

Les exemplaires appartenant au Musée de Calcutta ont jusqu'à 7 millimètres de diamètre maximum, 5½ millimètres de diamètre minimum et 1½ millimètre de hauteur. Leur test est marron, subtransparent, passant au corné clair sur la moitié aperturale du dernier tour et aussi foncé en dessous qu'en dessus. La sculpture se compose de stries fines, assez serrées, obliquement subonduleuses, subégales et à peu près équidistantes en dessus ; du même système de stries, mais plus fines en dessous. Il n'y a pas trace de sculpture spirale, et ce fait vient à l'appui des observations de W. H. DALL d'après lesquelles la sculpture spirale est

¹ Cette variété a été figurée par W. G. BINNEY [*Land and Fresh water Shells of North America*, part II, Washington, Sept. 1865, p. 126, fig. 209] et par W. H. DALL [*Land and Fresh water Mollusks of Alaska and adjoining regions, Harriman Alaska Expedition*, XIII, New-York, 1905, fig. 72 (à la page 91)]. Elle est connue d'un grand nombre de localités s'échelonnant, le long de la côte pacifique, jusqu'à l'Alaska.

très faible ou absente chez les individus des régions méridionales accentuée chez ceux des contrées septentrionales.¹

Il convient de rattacher au *Planorbis opercularis* Gould, comme variétés :

Le *Planorbis multilineatus* Vanatta² dont la sculpture spirale est particulièrement accentuée ;³

Et le *Planorbis centervillensis* Tryon⁴ chez lequel la carène du dernier tour est obsolète.⁵

Planorbis (Menetus) exacutus Say.

- 1821. *Planorbis exacutus* SAY [errore typogr. p. *exacutus*], *Journal Academy Natural Sciences Philadelphia*, II, p. 168.
- 1824. *Planorbis exacutus* SAY, *Long's Expedit. Report*, II, p. 261.
- 1839. *Paludina hyalina* LEA, *Transact. American Philosoph. Society*, VI, p. 17, pl. xxiii, fig. 81 [= monstuosité scalaire].
- 1841. *Planorbis exacutus* GOULD, *Report on the Invertebrata of Massachusetts*, p. 208; fig. 137.
- 1843. *Planorbis exacutus* DE KAY, *Zoology of New-York*, part V, *Mollusca*, p. 63, pl. iv, fig. 62a-62b.
- 1844. *Planorbis buchanensis* LEA, *Transact. American Philosoph. Society*, IX, p. 6.
- 1844. *Planorbis exacutus* HALDEMAN, *Monograph of the Limniades and other Fresh Water Univalve Shells*, p. 21, pl. iv, fig. 1-3.
- 1865. *Planorbis exacutus* BINNEY, *Land and Freshwater Shells North Amer.*, part II, p. 126, fig. 210; 211 et 212.
- 1878. *Planorbis (Nautilina) exacutus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 244, No. 28.
- 1878. *Planorbis exacutus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*. XX, London, pl. xi, fig. 94.
- 1886. *Planorbis exacutus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 133, No. 79, taf. xyiii, fig. 9.
- 1905. *Planorbis (Menetus) exacutus* DALL, *Land and Freshwater Mollusks of Alaska*, New-York, p. 91.]
- 1918. *Planorbis exacutus* BRYANT WALKER, *Synopsis . . . Fresh Water Mollusca North America, etc. . . .*, *University of Michigan. Miscellaneous Publications No. 6*, Michigan, p. 99.

LOCALITÉ :

Etats-Unis : New-York [W. A. BROWN] ; 5 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Ce Planorbe habite les Etats-Unis et le Canada, mais seulement à l'est des Montagnes Rocheuses. Au sud, le *Planorbis exa-*

¹ DALL (W. H.), *loc. supra cit.*, New-York, 1905, p. 91.

² VANATTA (E. G.), *The Nautilus*, Philadelphia, XIII, 1899, p. 48 [= *Planorbis oregonensis* VANATTA, *The Nautilus*, IX, 1895, p. 53, non *Planorbis oregonensis* TRYON, 1865, qui est le *Planorbis trivolvis* Say].

³ Cette variété habite l'Oregon [E. G. VANATTA].

⁴ TRYON (G. W.), *Monograph Fresh water Univalve Moll. United States*, 1872, p. 57, pl. vii, fig. 7-9.

⁵ Cette variété a principalement été signalée en Californie ; elle est également connue de l'Oregon et de l'Alaska [G. W. TRYON].

cutus Say ne dépasse pas le Nouveau Mexique ; au nord il s'étend jusqu' au bassin du Yukon, dans l'Alaska. Il est inconnu à l'ouest des Montagnes Rocheuses, c'est-à-dire sur le versant pacifique, où il est remplacé par une espèce représentative, le *Planorbis opercularis* Gould.¹

Les jeunes individus du *Planorbis exacutus* Say ressemblent beaucoup à certains exemplaires du *Planorbis dilatatus* Gould.² mais cette dernière possède une callosité aperturale bien développée quimanque toujours à l'espèce de SAY.

Le test de ce Planorbe est d'un corné clair, parfois d'un brun marron presque noir aux premiers tours. La sculpture des exemplaires appartenant au Musée de Calcutta se compose, en dessus, de nombreuses stries longitudinales fines, inégales, assez serrées et peu obliques. Le même système de striation s'observe en dessous, mais les stries sont plus serrées et coupées de rares stries spirales très fines.

La taille varie de 4 à 5 millimètres de diamètre maximum et de 3½ à 4 millimètres de diamètre minimum. La hauteur oscille autour de 1 millimètre. Mais il existe, dans le Manitoba³ une variété de grande taille, atteignant 7, 8 millimètres de diamètre maximum, 6 millimètres de diamètre minimum et 2 millimètres de hauteur à laquelle W. H. DALL a donné le nom de variété *megas*.⁴ Cette variété diffère encore du type par son test garni de stries spirales beaucoup plus fortement marquées.

Sous-Genre *Hippeutis* Agassiz, 1837.

- 1837. *Hippeutis* AGASSIZ, in : DE CHARPENTIER, Catalogue Mollusques terr. fluviat. Suisse, Denschr. Schweiz. Gesellsch. Naturforsch., Neuchâtel, I, p. 22.
- 1837. *Hippeutis* GRAY, in : TURTON, *A Manual Land and Freshwater Shells Brit. Islands*, 2^e Edit., London, p. 243.
- 1840. *Hippeutis* HARTMANN, *Systematische Übersicht der Europäischen Guthungen* (Tableau paru, en 1840, avec la 1^{re} livraison de l'ouvrage mentionné ci-dessous : HARTMANN, 1844).
- 1844. *Hippeutis* HARTMANN, *Erd-und Süßwasser-Gasteropoden der Schweiz*, St. Gallen, V, p. 51 et p. 87.
- 1850. *Segmentina* (part) STEIN, *Die lebenden Schnecken und Muscheln d. Umgegend Berlins*, Berlin, p. 78 [non *Segmentina* FLEMING, 1817] [= *Segmentina* + *Hippeutis*].
- 1855. *Segmentina* MOQUIN-TANDON, *Histoire Mollusques terr. et fluviat. France*, II, Paris, p. 423, et p. 426.

¹ Cf. : ante, p. 152.

² GOULD (A. A.), *Report on the Invertebrata of Massachusetts, Comprising the Mollusca, Annelida and Radiata*, Cambridge, 1841, p. 210, fig. 140 [non PFEIFFER]; = *Planorbis dilatatus* HALDEMAN, *Monograph of the Limniades and other Freshwater Shells*, 1844, p. 23, pl. iv, fig. 16-18; = *Planorbis lens* LEA, *Transactions American Philosoph. Society*, VI, 1839, p. 68, pl. xxiii, fig. 83 [non *Planorbis lens* Brongniart, 1810]; = *Planorbis Brongniartiana* LEA, *Transactions American Philosoph. Society*, IX, 1842, p. 24; = *Planorbis lenticularis* LEA, *Transactions Philosoph. Society*, 1884, p. 6 [non *Planorbis lenticularis* SCHLOTHEIM 1818].

³ A Birtle (Manitoba) [R. M. CHRISTY].

⁴ DALL (W. H.), *Land and Freshwater Mollusks of Alaska and adjoining Regions, Harriman Alaska Expedition*, XIII, New-York, 1905, p. 91 [*Planorbis exacutus* *megas*].

1859. *Hippeutis* GRAY, *Figures Mollusous Animals*, London, IV, p. 119.
 1864. *Hippeutis* MÖRCH, *Vidensk. Meddel.*, p. 316.
 1885. *Hippeutis* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 84, No. 8.
 1886. *Hippeutis* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 34, No. 11.
 1899. (Avril) *Hippeutis* MARTENS, *Land and Freshwater Mollusks (Biologia Centrali-Americana)*, London, p. 397.
 1905. *Hippeutis* DALL, *Land and Freshwater Mollusks of Alaska, Harriman Alaska Expedition*, XIII, New-York, p. 82 et p. 86.

Coquille petite, lenticulaire, très aplatie, étroitement ombiliquée en dessous ; spire formée de tours peu nombreux, le dernier très embrassant et fortement caréné ; ouverture cordiforme très allongée ; test très brillant

Type : *Planorbis fontanus* Lightfoot.

Les *Hippeutis* sont de très belles coquilles recherchant les eaux claires et limpides, les fontaines et les petits ruisseaux où elles vivent au milieu des plantes aquatiques. Elles habitent tout le système paléarctique.

Planorbis (Hippeutis) fontanus Lightfoot.

1786. *Helix fontana* LIGHTFOOT, *Philosoph. Transact.*, London, XXVI, part I, p. 165, pl. ii, fig. 1.
 1805. *Planorbis complanatus* DRAPARNAUD, *Histoire Mollusques France*, p. 47, pl. ii, fig. 20 à 22 [non *Helix complanata* LINNÉ].
 1812. *Helix lenticularis* ALTEN, *System-Abhandl.*, p. 35, taf. ii, fig. 4.
 1814. *Planorbis fontanus* FLEMING, *Edinburgh Encyclop.*, VII, I, p. 69.
 1829. *Planorbis lenticularis* STURM, *Deutschland Fauna*, VIII, fig. 16.
 1838. *Segmentina* (?) *fontana* BECK, *Index Molluscorum*, p. 123.
 1840. *Planorbis nitidus* GRAY, in : TURTON *Shells Britann.*, p. 268, pl. viii, fig. 8 [non MÜLLER].
 1842. *Hippeutis lenticularis* HARTMANN, *Erd-und Süßwasser-Gasterop. d. Schw.*, p. 51.
 1851. *Planorbis fontanus* DUPUY, *Histoire Mollusques terr. fluviatiles France*, p. 447, pl. xxi, fig. 15.
 1855. *Planorbis fontanus* MOQUIN-TANDON, *Histoire Mollusques terr. fluvial. France*, II, p. 426, pl. xxx, fig. 10 à 17.
 1875. *Planorbis complanatus* WESTERLUND, *Malakozool. Blätter*, XXII, p. 116, No. 22, taf. iv, fig. 31 à 33.
 1878. *Planorbis nitidus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. ii, fig. 15a-15b.
 1878. *Planorbis (Hippeutis) complanatus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 245, No. 41.
 1878. *Planorbis (Hippeutis) complanatus* NEVILL, *Second Yarkand Mission, Mollusca*, Calcutta, p. 11, No. 24.
 1882. *Planorbis fontanus* LOCARD, *Prodrome, Catalogue Mollusques terr. fluv. France*, p. 186.
 1885. *Planorbis complanatus* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 84, No. 48.
 1886. *Planorbis complanatus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit. Nürnberg, XVII, p. 69, No. 42, taf. xv, fig. 1.
 1893. *Planorbis fontanus* LOCARD, *Coquilles fluviatiles France*, p. 62, fig. 54-56.

1899. *Planorbis fontanus* LOCARD, Conchyliologie portugaise. Les Coquilles terr. eaux douces et saumâtres, *Archives Muséum Hist. natur.* Lyon, VII, p. 182.
1913. *Planorbis (Hippëutis) fontanus* GERMAIN, *Mollusques France et régions voisines*, Paris, p. 259, fig. 291-292.

LOCALITÉS :

Angleterre : sans localité précise [Coll. G. NEVILL].

France : Environs de Bayonne (Basses-Pyrénées).

Suisse : sans localité précise [Dr. F. STOLICZKA].

Asie Antérieure : Yarkand, sans localité précise [Dr. F. STOLICZKA].

DISTRIBUTION GÉOGRAPHIQUE.

Le *Planorbis (Hippëutis) fontanus* Lightfoot vit dans toute l'Europe y compris au nord, la Suède, la Norvège [C. A. WESTERLUND]¹ et la Finlande [A. LUTHER²]; au sud l'Espagne [Dr. G. SERVAIN³], le Portugal [A. NOBRE,⁴ A. LOCARD⁵], l'Italie,⁶ le Montenegro et l'Albanie [OTTO WOHLBEREDT⁷], etc. . . Dans l'Afrique du Nord—et notamment en Algérie—ce Planorbe est remplacé par des espèces représentatives comme les *Planorbis (Hippëutis) cuphaeus* Bourguignat,⁸ *Planorbis (Hippëutis) diaphanellus* Bourguignat,⁹ *Planorbis (Hippëutis) Raymondii* Bourguignat,¹⁰ etc. . . . En Asie, son aire de dispersion s'étend jusqu'au Yarkand [Dr. F. STOLICZKA, in G. NEVILL, *loc. supra cit.*, 1878, p. 11; = Dr. E. von MARTENS¹¹] et dans les régions occidentales de la Sibérie [C. A. WESTERLUND¹²]. Il est particulièrement répandu dans quelques régions de la Transcaucasie [DE FILIPPI, in : A. ISSEL¹³].

¹ WESTERLUND (C. A.), *Exposé critique des Mollusques terr. eau douce Suède et Norvège*, Upsal, 1871, p. 138 [sous le nom de *Planorbis complanatus*].

² LUTHER (A.), *Bidrag till kännedom om en Land-och Sötvattengastropodernas utbredning i Finland*, *Acta Societatis pro Flora et Fauna Fennicae*, Helsingfors, XX, No. 3, 1901, p. 109.

³ SERVAIN (DR. G.), *Etude sur les Mollusques recueillis en Espagne et en Portugal*, Saint-Germain, Août 1880, p. 141 (sous le nom de *Planorbis complanatus*).

⁴ NOBRE (A.) *Catalogue Mollusques environs de Coimbre (Portugal)*, *Mémoires Société royale malacologique Belgique*, Bruxelles, XX, 1885.

⁵ LOCARD (A.), *Conchyliologie portugaise. Les coquilles terr. des eaux douces et saumâtres*; *Archives Muséum Hist. natur.* Lyon, VII, 1899, p. 183.

⁶ Ce Planorbe a été signalé en Italie par de nombreux auteurs : C. POLLONERA, C. PORRO, C. A. STATUTI, etc. . .

⁷ WOHLBEREDT (OTTO), *Zur Fauna Montenegro und Nordalbanien*, *Wissenschaftl. Mitteilung. aus Bosnien und d. Herzegowina*, Wien, XI, 1909, p. 104.

⁸ BOURGUIGNAT (J. R.), *Malacologie Algérie*, II, 1864, p. 165, pl. ix. fig. 35 à 38.

⁹ BOURGUIGNAT (J. R.), *Malacologie Algérie*, II, 1864, p. 167, pl. ix, fig. 39 à 42.

¹⁰ BOURGUIGNAT (J. R.), *Malacologie Algérie* II, 1864, p. 168, pl. ix, fig. 43 à 46.

¹¹ MARTENS (DR. E. von), *Über Centralasiatische Mollusken*, *Mémoires Académie Sciences Saint Petersburg*, VII^e série, XXX, No. 11, 1882, p. 50.

¹² WESTERLUND (C. A.), *Sibiriens Land-och Sötvatter—Mollusker*, Stockholm, 1877, p. 62, No. 6.

¹³ ISSEL (A.), *Molluschi raccolti della Missione Italiana in Persia*, *Memorie d. Reale Accademia delle Scienze di Torino*, ser. II, t. xxiii, 1865, p. 44.

Cette espèce bien connue habite les ruisseaux, les fontaines et, en général, les eaux calmes et tranquilles. Elle présente, notamment dans la position de la carène qui ceint le dernier tour, des variations que nous préciserons à propos de l'espèce suivante.

Parmi les exemplaires de ce *Planorbe* appartenant au Musée de Calcutta, il faut mentionner spécialement ceux recueillis au Yarkand par le Doct. F. STOLICZKA. Comparés aux individus de l'Europe, ils n'en diffèrent que par leur taille très faible, les plus grands specimens atteignant seulement 3 millimètres de diamètre maximum. Le test, très finement strié (stries délicates, serrées, peu obliques, sensiblement égales en dessus et en dessous), est d'un corné pâle absolument transparent.

Planorbis (Hippentis) euphaeus Bourguignat.

1864. *Planorbis euphaeus* BOURGUIGNAT, *Malacologie terr. fluviat. Algérie*, II, p. 165, pl. ix, fig. 35-38.
 1880. *Planorbis complanatus* var. *Kobelti* HAZAY.
 1885. *Planorbis euphaeus* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 84.
 1886. *Planorbis euphaeus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 66, No. 39, taf. xv, fig. 10.
 1899. *Planorbis euphaeus* LOCARD, *Conchyliologie portugaise. Les Coquilles terr. eaux douces et saumâtres, Archives Muséum Hist. natur. Lyon*, VII, p. 183.

LOCALITÉ :

Algérie : Ruisseaux de la Maison Carrée, à Alger.

DISTRIBUTION GÉOGRAPHIQUE.

Ce *Planorbe* vit en Algérie [J. R. BOURGUIGNAT¹] mais n'a jamais été signalé ni au Maroc, ni en Tunisie. Il habite également le Portugal [A. LOCARD²] et le midi de la France où il est rare [A. LOCARD³]. Enfin HAZAY l'a retrouvé en Hongrie⁴ et C. A. WESTERLUND l'indique au Danemark.⁵

Le *Planorbis (Hippentis) euphaeus* Bourguignat est certainement très voisin du *Planorbis (Hippentis) nitidus* Lightfoot dont il ne constitue qu'une forme représentative.

En examinant une série de formes de ce groupe on constate que le dernier tour présente une carène toujours très développée, tranchante, dont la position est tout à fait variable.

¹ BOURGUIGNAT (J. R.), *Malacologie terr. fluviat. Algérie*, II, Paris, 1864, p. 165.

² LOCARD (A.), *loc. supra cit.*, Lyon, VII, 1899, p. 183.

³ LOCARD (A.), *Conchyliologie française. Les Coquilles des eaux douces et saumâtres*, Lyon et Paris, 1893, p. 62.

⁴ Hazay

(*Planorbis complanatus* variété *Kobelti* Hazay). La coquille ainsi désignée par HAZAY est une forme major atteignant jusqu'à 7-8 millimètres de diamètre maximum alors que le type *euphaeus* mesure de 4 à 5 millimètres de diamètre maximum.

⁵ WESTERLUND (C. A.), *Fauna der paläarct. region Binnenconchylien*, V, Lund, 1885, p. 85.

Dans le type *fontanus*, cette carène est médiane : c'est le cas le plus fréquent ; mais, parfois, cette carène est soit *basale*, soit *supramédiane*. Il existe ainsi, chez cette espèce, un polymorphisme de la carène analogue à celui que nous avons étudié en détail à propos du *Planorbis* (*Tropidiscus*) *planorbis* Linné et *Planorbis* (*Tropidiscus*) *carinatus* Müller.¹ C'est sur ces diverses positions de la carène qu'ont été établies les espèces démembrées du *Planorbis fontanus* Lightfoot.

Le *Planorbis* (*Hippeutis*) *euphaeus* Bourguignat est caractérisé par sa *carène basale*.² De plus, sa taille est légèrement plus faible (diamètre maximum : 2 à 4 millimètres ; hauteur maximum : $\frac{1}{2}$ à 1 millimètre).

Le *Planorbis* (*Hippeutis*) *sequanicus* Bourguignat³ possède, au contraire, une *carène supérieure*, c'est-à-dire *supramédiane*. Sa taille est à peu près la même : 4 millimètres de diamètre maximum et 1 millimètre d'épaisseur.⁴

De telles espèces n'ont guère que la valeur de variétés. Elles sont néanmoins intéressantes car elles donnent d'utiles indications sur le polymorphisme du *Planorbis* (*Hippeutis*) *fontanus* Lightfoot.

Genre *Segmentina* Fleming, 1817.

- 1817. *Segmentina* FLEMING, *Conchology*, in : D. BREWSTER, *Edinburgh Encyclop.*, Ed. VII, Vol. XII.
- 1819. *Hemithalamus* LEACH, *Molluscorum Britann. Synopsis, A Synopsis Mollusca Great Britain*, London, p. 137 (fide A. TURTON, *A Manual Land- and Fresh-Water Shells Brit. Isl., etc. . . .*, London, 1831, p. 116).
- 1828. *Segmentina* FLEMING, *A History of British Animals*, Edinburgh, p. 279.
- 1833. *Hemithalamus* FITZINGER, *Systematische Verzeichniss d. im Erzherzogthum Oesterr. vorkomm. Weichthiere*, p. 110.
- 1835. *Hemithalamus* ROSSMÄSSER, *Iconographie der Land- und Süßwasser-Mollusken*, I, part II, p. 15.
- 1840. *Segmentaria* SWAINSON, *A treatise on Malacology, etc. . . .*, London, p. 333 (*lapsus calami pro Segmentina* Fleming).
- 1842. *Segmentina* HALDEMAN, *A Monograph Limniades and other Fresh water Shells North America*, IV, p. 14.
- 1850. *Segmentina* (part) STEIN, *Die lebenden Schnecken und Muscheln d. Umgegend Berlins*, Berlin, p. 78 [= *Segmentina* + *Hippeutis*].
- 1855. *Segmentina* MOQUIN-TANDON, *Histoire Mollusques terr. fluviat. France*, II, Paris, p. 423 et p. 424 [*Planorbis* sous-genre *Segmentina*].
- 1885. *Segmentina* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 85.
- 1886. *Segmentina* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed., XVII, Nürnberg, p. 34, No. 10.

¹ Cependant ce polymorphisme est moins étendu chez les formes dérivées du *Planorbis* (*Hippeutis*) *fontanus* Lightfoot que chez celles du groupe du *Planorbis* (*Tropidiscus*) *planorbis* Linné.

² Par suite, l'ouverture est très oblique, irrégulièrement cordiforme, avec une angulosité inférieure accentuée.

³ BOURGUIGNAT (J. R.), in : LOCARD (A.), *Conchyliologie française. Les Coquilles des eaux douces et saumâtres*, Lyon et Paris, 1893, p. 62.

⁴ De plus cette forme présente le mode *microporus*.

1903. *Segmentina* WOODWARD, *List Brit. Nonmarine Mollusca*, p. 355.
 1905. *Segmentina* DALL, Land and Fresh water Mollusks of Alaska, *Harriman Alaska Expedition*, XIII, New-York, p. 97 [= *Segmentina* + *Planorbula*].

Coquille toujours très aplatie—rappelant celle des espèces de *Planorbes* du sous-genre *Hippeutis*—avec une spire à tours embrassants dont le dernier, très grand, est muni d'une carène aiguë; ouverture cordiforme transverse, intérieurement garnie de trois lamelles (une pariétale, une basale et une supérieure) disposées transversalement par rapport au sens spiral et limitant un étroit espace entre elles; test toujours brillant, souvent d'un beau coloris ambré, à peine strié.

Type: *Planorbis nitidus* Müller.

La disposition des lamelles internes peut varier. C'est ainsi que dans les espèces asiatiques (comme les *Segmentina Largillierii* Dunker, *Segmentina Swinhoei* H. Adams, etc. . . . , par exemple) la coquille, un peu moins comprimée, montre une ouverture également munie de trois denticulations: mais la dent pariétale est obliquement transverse; la dent basale est longue et transverse; enfin la dent supérieure, transverse comme la précédente, est parfois double. C'est en se basant sur ces légères différences que H. A. PILSBRY et J. H. FERRISS ont établi le sous-genre *Polypylis*.¹ Je ne crois pas devoir adopter ce sous-genre qui m'apparaît comme une modification par trop peu importante du type générique *Segmentina*.

§ I.

Segmentina nitida Müller.

1774. *Planorbis nitidus* MÜLLER, *Verm. terrest. et fluvial. Histor.* II, p. 103, No. 349 [non GRAY, 1840, in: TURTON, *Shells Brit.*, p. 268, pl. viii, fig. 7 = *Planorbis (Hippeutis) fontanus* LIGHTFOOT, nec MICHAUD, *id.*].
 1784. *Helix lineata* BOYS et WALKER, *Testac. minut. var.* pl. i, fig. 28.
 1786. *Nautilus lacustris* LIGHTFOOT, *Transact. philosoph. Society*, LXXVI, part I, p. 103, pl. i, fig. 1-7.
 1788. *Helix nitida* GMELIN, *Systema naturae*, Ed. XIII, p. 3624 [non MÜLLER].
 1801. *Planorbis complanatus* POIRET, *Prodrome Mollusques environs Paris*, p. 93 [excl. synonym. LINNÉ; non DRAPARNAUD, 1805, *Hist. Mollusques*, p. 47, pl. ii, fig. 20-22; = *Planorbis (Hippeutis) fontanus* LIGHTFOOT, non STUDER, 1789, *Fauna Helvetica*, in: COXE, *Trav. Switzerl.* III, p. 455 = *Planorbis (Gyrorbis) umbilicatus* MÜLLER].
 1820. *Planorbis clausulatus* DE FERUSSAC, *Concordance Mollusques, Journal de Physique*, p. 240.
 1823. *Planorbis nautileus* STURM, *Deutschland Fauna*, VI, taf. xv [non auct.].
 1828. *Segmentina lineata* FLEMING, *British Animals*, London, p. 279.
 1830. *Segmentina nitida* FLEMING, *Edinburgh Encyclop.*, XII, p. 367, fig. 8.

¹ PILSBRY (H. A.) et FERRISS (J. H.), *Mollusca of the Southern States II, Proceedings Academy Natural Sciences of Philadelphia*, LVIII, 1906, p. 166.

1831. *Hemithalamus lacustris* LEACH, *British Mollusc.*, p. 137, [excl. TURTON].
1840. *Segmentina lacustris* SWAINSON, *Treatise on Malacol.*, London, p. 338.
1851. *Planorbis nitidus* DUPUY, *Histoire Mollusques terr. fluv. France*, p. 448, pl. xxi, fig. 14.
1855. *Planorbis nitidus* MOQUIN-TANDON, *Histoire Mollusques terr. fluv. France*, II, Paris, p. 424, pl. xxx, fig. 5-9.
1862. *Planorbis lineatus* JEFFREYSS, *British Conchology*, I, London, p. 79.
1875. *Planorbis (Segmentina) nitidus* WESTERLUND, *Malakozoolog. Blätter*, XXII, p. 117, No. 24.
1878. *Planorbis lacustris* SOWERBY, *Monograph of the Genus Planorbis*, in : I. REEVE, *Conchologia Iconica*, XX, pl. ii, fig. 16a-16b.
1878. *Planorbis (Segmentina) nitidus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 48.
1878. *Planorbis (Segmentina) nitidus* NEVILL, *Second Yarkand Mission, Mollusca*, Calcutta, p. 11, No. 23.
1882. *Planorbis nitidus* LOCARD, *Prodrome, Catalogue Mollusques terr. fluv. France*, p. 185.
1885. *Planorbis (Segmentina) nitidus* WESTERLUND, *Fauna d. paläarct. region Binnenconchylien*, V, p. 86, No. 52.
1886. *Planorbis nitidus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 67, No. 41, taf. xiii, fig. 20 à 22.
1893. *Planorbis nitidus* LOCARD, *Coquilles fluviatiles France*, p. 63, fig. 57-60.
1913. *Segmentina nitida* GERMAIN, *Mollusques France et regions voisines*, p. 260, fig. 288-290.

LOCALITÉS :

Allemagne : sans localité précise [G. NEVILL].

Angleterre : sans localité précise [G. NEVILL].

France : sans localité précise [G. NEVILL].

Asie Antérieure : Yarkand [Dr. F. STOLICZKA]; douze exemplaires ; No. 30.

DISTRIBUTION GÉOGRAPHIQUE.

Habitant les ruisseaux, les fontaines et, en général, les eaux calmes et limpides, le *Segmentina nitida* Müller vit dans toute l'Europe où il s'avance, au Nord, jusque vers les 59°-60° lat. N., et même jusqu' au 62° lat. N. en Finlande [A. LUTHER].¹ En Asie, il a été signalé en Sibérie [C. A. WESTERLUND²], en Asie Mineure [R. STURANY³] et pénètre, dans le centre du continent, jusqu'au Yarkand.

Les individus les plus intéressants de la Collection du Musée de Calcutta sont ceux recueillis au Yarkand. Comparés aux

¹ LUTHER (A.), *Bidrag till kännedom om Land- och Sötvattengastropodernas utbredning i Finland*, *Acta Societatis pro Fauna et Flora Fennicae*, XX, No. 3, Helsingfors, 1901, p. 110.

² WESTERLUND (C. A.), *Sibiriens Land- och Sötvatten-Mollusker*, Stockholm, 1877, p. 108.

³ STURANY (R.), *Beitrag z. Kenntniss d. Kleinasiatischen Mollusken fauna*, *Sitzungsber. d. Kaiserl. Akad. d. Wissensch. Wien, Mathem.-Natur. Cl.*, CXI, Mars 1902, p. 137.

specimens européens, ils sont de taille très notablement plus petite, les plus grands atteignant seulement de $3\frac{1}{2}$ à 4 millimètres de diamètre maximum. D'autre part, les échantillons du Yarkand ont une forme proportionnellement moins déprimée; la spire possède bien le même nombre de tours et le même enroulement, mais le dernier tour, dont le profil rappelle celui du *Segmentina calatha* Benson,¹ a une carène subbasale plus émoussée et il est un peu moins dilaté à l'extrémité; il résulte, de ce dernier fait, que l'ouverture est un peu moins cordiforme transverse.² Le test est d'un corné ambré un peu rougeâtre, assez brillant, garni de très fines stries longitudinales peu obliques, serrées, aussi accentuées en dessous qu'en dessus.

En résumé, la Segmentine du Yarkand appartient bien au *Segmentina nitida* Müller; elle doit être considérée comme une forme plus globuleuse rappelant un peu les Segmentines de l'Inde et, notamment, le *Segmentina calatha* Benson.

Segmentina Clessini Westerlund.

- 1873. *Planorbis clessini* WESTERLUND, *Fauna Molluscor. Suec. Norveg. et Daniae*, p. 613.
- 1875. *Planorbis clessini* WESTERLUND, *Malakozool. Blätter*, XXII, p. 117, No. 25, taf. ii, fig. 27 à 30.
- 1877. *Planorbis clessini* CLESSIN, *Deutsche Excurs. Mollusken-Fauna*, 3^e fasc. p. 420, fig. 227.
- 1881. *Segmentina clessini* SERVAIN, *Histoire Malacologique lac Balaton*, p. 88.
- 1885. *Planorbis (Segmentina) nitidus* var. *Clessini* WESTERLUND, *Fauna der paläarct. region Binnenconchylien*, V, p. 86.
- 1886. *Planorbis Clessini* CLESSIN, *Die Familie der Limnaeiden. in: MARTINI et CHEMNITZ, Systemat. Conchylien-Cabinet*, XVII, p. 65, No. 38, taf. xv, fig. 2.

LOCALITÉ :

Angleterre : Environs de Londres ; No. P. 129 B.

DISTRIBUTION GÉOGRAPHIQUE.

Cette Segmentine vit dans les régions moyennes et septentrionales de l'Europe : Angleterre, Belgique, nord de l'Allemagne, nord de la Hongrie, Galicie, Russie, Suède et Norvège.

Coquille de taille médiocre, convexe en dessus, avec une région centrale subombiliquée, légèrement subconvexe en dessous avec un ombilic étroit et profond; spire composée de 4-5 tours très embrassants, à croissance très rapide, le dernier très grand, plus convexe en dessus qu'en dessous, avec une carène inframédiane aiguë, formant, en dessous, presque toute la coquille; sutures profondes; ouverture horizontalement cordiforme, à bords

¹ Voir, au suj et de cette espèce, p. 168, de ce Mémoire.

² En réalité l'ouverture, qui est plus étroite que dans la forme européenne est presque ovulaire, à peine subcordiforme.

marginaux très arqués et convergents, péristome simple, souvent rouge vineux.

Diamètre maximum : millimètres ; diamètre minimum : millimètres ; hauteur maximum : millimètres ; diamètre de l'ouverture : millimètres ; hauteur de l'ouverture : millimètres.

Test mince, subtransparent, corné blond ou fauve, très luisant, plus coloré vers l'ouverture, orné de stries longitudinales très fines, serrées, inégales, irrégulières, obliquement flexueuses, à peine plus délicates en dessous qu'en dessus.

Après avoir considéré cette *Segmentina* comme parfaitement distincte,¹ C. A. WESTERLUND la rapporte, comme variété,² au *Segmentina nitida* Müller. En réalité ces deux coquilles sont très voisines et le *Segmentina Clessini* Westerlund peut être considéré comme la forme septentrionale du *Segmentina nitida* Müller, bien que le domaine géographique du premier empiète, au sud, sur celui du second.³ Du point de vue morphologique, le *Segmentina Clessini* Westerlund se distingue du *Segmentina nitida* Müller :

Par sa spire moins convexe en dessus ; par son dernier tour proportionnellement plus grand, encore plus embrassant, plus convexe en dessous, entouré d'une carène aiguë inframédiane mais non basale—comme chez le *Segmentina nitida* Müller—; par son ombilic plus étroit ; par son ouverture moins oblique, proportionnellement plus développée en largeur.

§ II.

Segmentina planodisca Melvill et Ponsonby.

1897. *Planorbis* (*Segmentina*) *planodiscus* MELVILL, et PONSONBY, *Annals and Magaz. of Natural History*, London, XIX, p. 638, pl. xvii, fig. 10 (Juillet 1897).
 1898. *Planorbis* (*Segmentina*) *planodiscus* Sturany, *Catalog der ... Südafrikanischen Land- und Süßwasser-Mollusken*, *Denkschr. d. kais. Akad. der Wissenschaftl. Wien*, I, XVII, p. 614 (tirés à part, p. 77).
 1912. *Segmentina planodiscus* CONNOLLY, *Annals South African Museum*, XI, part III, London, p. 239, No. 505.

LOCALITÉ :

Afrique Australe : Ovambondé (Ovampoland) ; 3 exemplaires ; No. 1a.

DISTRIBUTION GÉOGRAPHIQUE.

Découverte au Natal, dans l'Umgeni Valley près de Durban [BURNUP], cette intéressante espèce n' avait pas été retrouvée.

¹ WESTERLUND (C. A.), *Malakozische Studien, Kritiken und Notizen*, *Malakozool. Blätter*, XXII, 1875, p. 117.

² WESTERLUND (C. A.), *Fauna der in der Paläarktischen Region ... lebenden Binnenconchylien*, V, Lund, 1885, p. 26.

³ Le *Segmentina nitida* Müller vit dans toute l'Europe mais ne dépasse pas, au nord, les 59°-60° de latitude nord [sauf en Finlande où il atteint le 62° de lat. N.]. Comme on l'a vu ci-dessus, le *Segmentina Clessini* Westerlund remonte beaucoup plus haut, mais il ne dépasse pas, au sud, la latitude de la Belgique.

Les exemplaires du Musée de Calcutta correspondent bien à la description et à la très exacte figuration données par J. C. MELVILL et J. H. PONSONBY ; cependant ils possèdent $5\frac{1}{2}$ tours de spire (au lieu de 5), séparés, comme le disent les auteurs de l'espèce, par des sutures canaliculées ; "... anfractibus quinque ad suturas canaliculatis ..." Le dernier tour est grand, bien embrassant, dilaté à l'extrémité et limite, en dessous, un ombilic assez étroit et profond.

Le grand diamètre varie de $3\frac{1}{2}$ à 4 millimètres, le petit diamètre de 3 à $3\frac{1}{2}$ millimètres et la hauteur de $1\frac{1}{2}$ à $1\frac{3}{4}$ millimètre.¹ Le test est corné, un peu ambré et brillant, légèrement rougeâtre en dessous ; il est garni de stries longitudinales d'une grande ténuité, serrées, un peu inégales, subobliques, bien visibles même sur les premiers tours et à peine plus fines en dessous.²

En dehors de cette espèce, la seule *Segmentina* connue de l'Afrique Australe est le *Segmentina emicans* Melvill et Ponsonby³ qui en diffère considérablement.

§ III.

Segmentina calatha Benson.

- 1850. *Planorbis calathus* BENSON, *Annals and Magaz. Natural History*, London, ser. 2, V, p. 349.
- 185. *Planorbis calathus* THEOBALD, *Moll. Asiatic Society of Bengal*, p. 99.
- 1856. *Segmentina calatha* H. et A. ADAMS, *Genera of recent Mollusca*, III, p. 264.
- 1876. *Planorbis calathus* HANLEY et THEOBALD, *Conchologia Indica*, p. xviii et p. 18, pl. xxxix, fig. 1 à 3.
- 1878. *Planorbis calathus* SOWERBY, *Monograph of the genus Planorbis*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien Cabinet*, XX, pl. iv, fig. 30a-30b.
- 1878. *Planorbis (Segmentina) calathus*, NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 47.
- 1883. *Segmentina calathus* TAPPARONE-CANEFRI, *Annali Museo Civico di Storia Naturale di Genova* XIX, p. 249, No. 250.
- 1886. *Planorbis calathus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 136, No. 112, taf. xv, fig. 13.
- 1897. *Planorbis (Segmentina) calathus* MARTENS, *Süss- und Brackwasser-Mollusken*, in : DR. M. WEBER, *Zoolog. Ergebnisse Niederländisch Ost-Indien*, Leiden, IV, p. 15, No. 5.
- 1915. *Planorbis (Segmentina) calathus* PRESTON, *Fauna of British India, Mollusca [Freshwater Gastropod. and Pelecypoda]*, London, p. 187, No. 258.
- 1918. *Planorbis calathus* ANNANDALE, *Records Indian Museum*, XIV, Calcutta, p. 113.

¹ Les grands individus étudiés par J. C. MELVILL et J. H. PONSONBY atteignent 5 millimètres de diamètre maximum (*loc. supra cit.*, 1897, p. 638).

² Les lamelles internes sont très visibles au travers de la coquille et se traduisent, à la face inférieure, par des radiations plus claires autour de l'ombilic.

³ MELVILL (J. C.) et PONSONBY (J. H.), *Descriptions of Thirteen new Species of Terrestrial and Fresh-water Mollusca from South Africa*, *Annals and Magazine of Natural History*, 6^e série, X, London, Septembre 1892, p. 241, No. 13. pl. xlii, fig. 13-13a [*Planorbis (Segmentina) emicans*].

LOCALITÉS :

Indes Anglaises : Manbhum [Collect. V. BALL]; quinze exemplaires; = Moradabad [Collect. BENSON, ex Collect. Asiatic Society of Bengal]; cinq exemplaires; = Chandernagore [Colonel G. B. MAINWARING]; = Assam [Dr. T. OLDHAM]; = Ava [Collect. DR. J. ANDERSON]; = Ceylan : Galle; 15 exemplaires.

Inlé Lake (province de Yawngnwe, sur le Shan Plateau, vers 900 mètres d'altitude [DR. N. ANNANDALE]; nombreux exemplaires.¹

DISTRIBUTION GÉOGRAPHIQUE.

L'aire de dispersion géographique du *Segmentina calatha* Benson est considérable; mais cette espèce est souvent étroitement localisée: elle est alors fort abondante dans ses stations. Elle vit dans l'Inde entière y compris, au nord, les régions de l'Himalaya, du Cachemire et du Petit Tibet. Elle est également connue dans le royaume de Siam [G. NEVILL, in: *Mus. Berol.*, cf. S. CRESSIN, in: MARTINI et CHEMNITZ, *loc. supra cit.*, 1886, p. 137]. Au sud, en dehors, de l'île de Ceylan, où elle est commune, cette *Segmentina* a été signalée à Java [DR. MAX WEBER, in: DR. E. von MARTENS, *loc. supra cit.*, 1897, p. 15] et à l'île d'Aru, près de la Nouvelle Guinée [Prof. O. BECCARI, in: TAPPARONE-CONEFRI, *loc. supra cit.*, 1883, p. 249].

Le *Segmentina calatha* Benson est une espèce relativement haute, très étroitement ombiliquée, possédant un dernier tour énorme, très embrassant, muni d'une *carène basale*.

La taille atteint de 5 à 6 millimètres de diamètre maximum pour 4 à 5 millimètres de diamètre minimum et 2 à 2½ millimètres de hauteur. L'indice ombilical est de 10 seulement.

Le test, à peu près transparent, d'un corné ambré passant parfois au roux assez vif, très brillant, est orné, chez quelques individus, de bandes longitudinales plus claires; la sculpture se compose de stries longitudinales fines, serrées, inégales et médiocrement obliques, à peu près aussi accentuées en dessous qu'en dessus.

Segmentina hemisphaerula Benson.

Pl. II, fig. 13-14-15.

- 1842. *Planorbis hemisphaerula* BENSON, *Annals and Magaz. of Natural History*, London, IX, p. 487.
- 1855. *Planorbis hemisphaerula* BENSON, *Journal Asiatic Society of Bengal*, XXIV, p. 127.
- 1867. *Planorbis Largillierii* DUNKER, in: MARTENS, *Malakozoolog. Blätter*, XIV, p. 217, No. 7.
- 1878. *Planorbis Largillierii* SOWERBY, *Monograph of the genus Planorbis* in: REEVE, *Conchologia Iconica*, XX, pl. xii, fig. 103.

¹ Ils sont transparents, de coloration très claire ou brune, mais tous de très petite taille (3 millimètres de diamètre maximum) [DR. N. ANNANDALE, *loc. supra cit.*, 1918, p. 113].

1878. *Planorbis (Segmentina) sp.* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 49.
 1878. *Planorbis (Segmentina) hemisphaerula* NEVILL, *loc. supra cit.*, I, p. 246, No. 50.
 1886. *Planorbis Largillierii* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, p. 71, No. 44, taf. xv, fig. 3.¹

LOCALITÉS :

Chine : Ile de Chusan [Collect. DR. CANTOR] ; deux exemplaires ; = Canton [DAMON] ; deux exemplaires ; No. 67 ; = sans indication précise de localité [Collect. TAYLOR] ; un exemplaire ; No. P. 129 B.

DISTRIBUTION GÉOGRAPHIQUE.

Le *Segmentina hemisphaerula* Benson habite la Chine où on le connaît des environs de Canton [*Mus. Calcutta*] et de Hongkong [H. DOHRN, in : DR. F. von MARTENS, *loc. supra cit.*, 1867, p. 217], et des îles de Chusan [DR. CANTOR] et de Hai Meu (environs d'Amoy) [GUSTAV SCHLEGEL, in : DR. F. von MARTENS, *loc. supra cit.*, 1867, p. 217] dans la mer de Chine.

Après un examen très attentif des diagnoses originales et des exemplaires typiques appartenant au Musée de Calcutta je suis conduit à réunir les *Segmentina hemisphaerula* Benson et *Segmentina Largillierii* Dunker. Le nom de W. H. BENSON étant le plus ancien doit être adopté.

Les exemplaires de *Segmentina hemisphaerula* Benson sont identiques à ceux désignés par G. NEVILL dans son "*Handlist of the Mollusca in the Indian Museum Calcutta*" (p. 246, No. 49) sous la dénomination de "*Planorbis (Segmentina) sp.* [= ? *Pl. calathus* var.]", sauf cependant la coloration.² Le test est assez solide, un peu épais, finement strié. Les dimensions atteignent 6½ millimètres de diamètre maximum, 5½ millimètres de diamètre minimum et 3 millimètres de hauteur maximum. L'indice ombilical est de 25.

L'échantillon de *Segmentina Largillierii* Dunker a 7 millimètres de diamètre maximum, 6½ millimètres de diamètre minimum et 3½ millimètres d'épaisseur maximum. Son indice ombilical est de 28 ; c'est donc une forme très légèrement plus ombiliquée que le *Segmentina hemisphaerula* Benson, mais la différence est à peine sensible ; au reste les autres caractères sont identiques. Le test est roux fauve un peu brillant, orné, en dessus, de stries longitudinales médiocres,³ peu obliques, bien onduleuses, irrégulières, assez serrées et, en dessous, de stries plus faibles.⁴

¹ Indiqué, par erreur, (p. 71) taf. xv, fig. 1.

² Chez les échantillons de l'espèce No. 49 du Catalogue de G. NEVILL (et qui proviennent de la Chine, sans indication précise de localité), le test est très brillant ; comme verni, d'un fauve ardent presque rouge.

³ Sauf au voisinage de l'ouverture où les stries longitudinales sont plus fortes et assez inégales.

⁴ Aux environs de l'ouverture, les stries longitudinales sont également plus irrégulières et mieux accentuées.

La figure du *Segmentina Largillierti* Dunker donnée par G. B. SOWERBY [in : L. REEVE, *Conchologia Iconica*, XX, 1876, pl. xiii, fig. 103] laisse fortement à désirer. Le bord supérieur de l'ouverture est représenté comme flexueux et G. B. SOWERBY dit, dans sa diagnose : " apertura subtrigona, margine superiori flexuosi depressa . . . " ¹ ce qui s'applique à un exemplaire certainement anormal. La figuration donnée par S. CLESSIN est également des plus médiocre, surtout celle représentant la coquille vue de profil qui est tout à fait fantaisiste.

Le Dr. E. VON MARTENS donne, au *Segmentina Largillierti* Dunker des dimensions plus considérables : 7 et 8½ millimètres de diamètre maximum ; 5 et 7 millimètres de diamètre minimum ; enfin 2 et 3 millimètres de hauteur maximum.²

Le *Segmentina hemisphaerula* Benson est extrêmement voisin du *Segmentina calatha* Benson. L'enroulement des tours de spire, les caractères de l'ouverture, la nature du test et la sculpture sont identiques chez les deux espèces. Mais la première est de taille plus grande, sa forme est, proportionnellement, plus haute par rapport au diamètre maximum et sa cavité ombilicale plus élargie (l'indice ombilical du *Segmentina calatha* Benson est seulement de 10). En résumé, le *Segmentina hemisphaerula* Benson se rattache très étroitement au *Segmentina calatha* Benson dont il ne constitue guère qu'une variété de grande taille largement ombiliquée.

Segmentina Swinhoei H. Adams.

- 1870. *Planorbis Swinhoei* H. ADAMS, *Proceedings Zoological Society of London*, p. 378.
- 1878. *Planorbis Swinhoei* SOWERBY, *Monograph of the Genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. xiii fig. 113.
- 1878. *Planorbis (Segmentina) Swinhoei* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 42.
- 1886. *Planorbis Swinhoei* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 227, No. 253.

LOCALITÉ :

Chine : Ile de Formose [Collect. H. ADAMS] ; un exemplaire (cotype).

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est connue seulement de l'île de Formose.

L'unique exemplaire du Musée de Calcutta est un cotype donné par H. ADAMS lui-même. C'est une coquille mesurant 7½ millimètres de diamètre maximum, 6½ millimètres de diamètre minimum et 2¾ millimètres de hauteur. L'indice ombilical est de 33. L'ouverture a 3¼ millimètres de diamètre et 3 millimètres

¹ CLESSIN (S.), *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, XVII, Nürnberg, 1886, taf. xv, fig. 3. Le coloris des figures est assez exact.

² MARTENS (DR. E. von), *Ueber die ostasiatischen Limnaeaceen*, *Malakozoolog. Blätter*, XIV, 1867, p. 217.

de hauteur. Le test est d'un corné jaunâtre assez pâle avec, en dessus, des stries longitudinales très fines, serrées, irrégulières, peu obliquement onduleuses et, en dessous, plus fines et moins obliques.

Cette espèce appartient au groupe du *Segmentina calatha* Benson, mais se rapproche surtout du *Segmentina hemisphaerula* Benson, dont elle se sépare :

Par sa forme générale plus déprimée ; par sa spire dont les premiers tours sont légèrement élevés en dessus, tandis qu' ils sont enroulés sur le plan du dernier tour chez le *Segmentina hemisphaerula* Benson¹ ; par son ouverture plus développée en largeur par suite de la dilatation un peu plus grande du dernier tour vers son extrémité ; enfin et surtout par sa cavité ombilicale notablement plus large.

Il est fort probable que les *Segmentina calatha* Benson, *Segmentina Largillierii* Dunker *Segmentina hemisphaerula* Benson et *Segmentina Swinhoei* H. Adams appartiennent à une même espèce. Le premier est la forme la plus déprimée ; le second et le troisième sont les formes les plus élevées ; le dernier est, de ce point de vue, une forme intermédiaire. D'autre part, l'ombilic du *Segmentina calatha* Benson est très étroit ; déjà plus ouvert chez le *Segmentina hemisphaerula* Benson, il s'élargit encore chez le *Segmentina Largillierii* Dunker pour atteindre son maximum de diamètre—tout en restant relativement étroit—chez le *Segmentina Swinhoei* H. Adams.² Si bien que ce dernier constitue un mode *macroporus*, le mode *microporus* étant représenté par le *Segmentina calatha* Benson. Les affinités de ces diverses espèces peuvent se résumer de la manière suivante :

Segmentina Swinhoei
mode *macroporus* + mode *subelatus*.

Segmentina Largillierii
mode *submacroporus* + mode *elatus*.

Segmentina hemisphaerula
mode *submacroporus* + mode *perelatus*.

¹ D'ailleurs le mode d'enroulement des tours de spire est identique chez les *Segmentina calatha* Benson, *Segmentina hemisphaerula* Benson et *Segmentina Swinhoei* H. Adams ; de plus, ces trois espèces ont une carène basale plus ou moins émoussée.

² Rappelons les indices ombilicaux de ces diverses *Segmentines* : *Segmentina calatha* Benson : 10 ;—*Segmentina hemisphaerula* Benson : 25 ;—*Segmentina Largillierii* Dunker : 28 ;—*Segmentina Swinhoei* H. Adams : 33.

Segmentina hemisphaerula
mode submacroporus + mode perelatus.

Segmentina calatha
mode microporus + mode depressus.

Segmentina Cantori Benson.

1850. *Planorbis Cantori* BENSON, *Annals and Magazine of Natural History*, London, 2. ser., V, p. 349.
 1876. *Planorbis Cantori* HANLEY et THEOBALD *Conchologia Indica*, London, p. xviii et p. 18, pl. xl, fig. 1 à 3.
 1878. *Planorbis Cantori* SOWERBY, Monograph of the genus *Planorbis*, in : I. REEVE, *Conchologia Iconica*, XX, London, pl. x, fig. 79a-79b.
 1878. *Planorbis Cantori* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 43.
 1886. *Planorbis Cantori* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., Nürnberg, p. 158, No. 140, taf. xxiii, fig. 9.
 1915. *Planorbis (Segmentina) cantori* PRESTON, *Fauna of British India : Mollusca [Freshwater Gasterop- and Pelecypoda]*, London, p. 126, No. 257.

LOCALITÉS :

Indes anglaises : Jamálpur [DR. F. STOLICZKA];—Ceylon : Galle [H. F. BIANFORD] et Balapiti [G. NEVILL].

Chine : Hongkong ; No. 77c ; = Canton ; No. 249.

DISTRIBUTION GÉOGRAPHIQUE.

Cette *Segmentine* vit dans l'Inde. Elle semble beaucoup plus rare dans la Chine méridionale.

Cette *Segmentine* à *carène inframédiane* est une espèce déprimée se rapprochant du *Segmentina coenosa* Benson dont elle se distingue :

Par sa forme plus déprimée ; par sa spire à tours plus nombreux s'enroulant plus lentement ; par son dernier tour proportionnellement plus petit, muni d' une carène un peu émoussée bien inframédiane, presque subbasale, plus inférieurement placée que chez le *Segmentina coenosa* Benson ; par son ouverture mieux ovale ; enfin par son ombilic bien plus large (indice ombilical : 31¹).

Le *Segmentina Cantori* Benson atteint 7 millimètres de diamètre maximum, 6½ millimètres de diamètre minimum et seulement 2 millimètres de hauteur. Son indice ombilical est de 31. Le test est transparent, fauve roux très brillant en dessus et en

¹ L'indice ombilical du *Segmentina coenosa* Benson n'est que de 15.

dessous, muni de très fines stries longitudinales serrées et peu obliques.

Segmentina coenosa Benson.

1850. *Planorbis coenosus* BENSON, *Annals and Magazine of Natural History*, London, ser. 2, Vol. V, p. 349.
 1876. *Planorbis coenosus* HANLEY et THEOBALD, *Conchologia Iconica*, London, p. xviii et p. 18, pl. xxxix, fig. 7 à 9.
 1878. *Planorbis coenosus* SOWERBY, *Monograph of the Genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, pl. x, fig. 78a-78b.
 1878. *Planorbis (Segmentina) coenosus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 46.
 1886. *Planorbis coenosus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., Nürnberg, XVII, p. 165, No. 150, taf. xxiv, fig. 4.
 1915. *Planorbis (Segmentina) coenosus* PRESTON, *Fauna of British India: Mollusca [Freshwater Gasterop. and Pelecypoda]*, London, p. 127, No. 259.
 1918. *Planorbis coenosus* ANNANDALE, *Records Indian Museum*, XIV, Calcutta, p. 113.

LOCALITES :

Indes anglaises : Manbhum [Collect. V. BALL.] ; = Bhim Tal ; = Jamalpur : zone littorale de l'Inlé Lake, près du Fort Stedman (province de Yawngnaw, sur le Shan Plateau, vers 900 mètres d'altitude) [N. ANNANDALE] ; deux exemplaires de très petite taille (diamètre maximum : 2 millimètres).

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce habite l'Inde péninsulaire et l'île de Ceylon.

Coquille convexe en dessus avec une partie centrale concave, subméplane en dessous avec une cavité ombilicale étroite ; spire à tours bien embrassants, le dernier énorme, dilaté vers l'ouverture, muni d'une carène inframédiane peu saillante ; ouverture oblique, ovulaire subcordiforme, à bords marginaux un peu éloignés.

Diamètre maximum : $5\frac{1}{2}$ millimètres ; diamètre minimum : 5 millimètres, hauteur : 2 millimètres. Indice ombilical : 15.

Test roux, plus brillant en dessous qu'en dessus, orné de très fines stries irrégulières,¹ légèrement obliques et un peu onduleuses. Un exemplaire jeune, mais bien typique² est succiné-ambé très brillant, absolument transparent ; il présente, en dessus et en dessous, des stries longitudinales d'une grande ténuité.

Surtout voisin du *Segmentina Cantori* Benson, le *Segmentina coenosa* Benson appartient encore au groupe du *Segmentina calathia* Benson dont il se distingue par son enroulement plus rapide, sa forme générale plus déprimée, sa carène inframédiane mieux accusée, son ombilic plus large, etc. . . .

¹ Cependant, dans sa diagnose, W. H. BENSON [*loc. supra cit.*, 1850, p. 348] écrit : "Testa . . . oblique et rude (praeclipe subtus) radiato stricto . . .".

² Cet individu provient de Manbhum.

Segmentina sindica Benson.

1850. *Planorbis (Segmentina) indicus* BENSON, *Annals and Magazine of Natural History*, London, p. 350.
 1876. *Planorbis Indicus* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 18, pl. xl, fig. 4 à 6.
 1878. *Planorbis indicus* SOWERBY, *Monograph of the Genus Planorbis*, in : L. REEVE, *Conchologia Indica*, XX, London, p. 2 de l'Index alphabétique (non figuré).
 1915. *Planorbis (Segmentina) indicus* PRESTON, *Fauna of British India, Mollusca [Freshwater Gasterop. and Pelecypoda]*, London, p. 126, No. 256.

LOCALITÉ :

Indes anglaises : Ferozepore ; No. 129P.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est spéciale à l'Inde ; toujours rare, elle est cependant plus répandue dans le Haut Sind.

Coquille de petite taille (diamètre maximum : $2\frac{1}{2}$ millimètres ; hauteur maximum : $1\frac{1}{3}$ millimètre) à tours très embrassants¹ le dernier formant, en dessus et en dessous, presque toute la coquille, bien dilaté à son extrémité, muni d'une *carène inframédiane*² peu saillante, quoique bien marquée ; ombilic très étroit (indice ombilical : 13).

Test mince, fragile, jaunâtre, avec en dessus et en dessous des stries longitudinales très fines, serrées, peu obliques, mêlées de rares stries plus fortement accentuées.

Segmentina trochoidea Benson.

1836. *Planorbis trochoideus* BENSON, *Journal Asiatic Society of Bengal*, V, p. 742.
 1836. *Planorbis trochoideus* BENSON, *Gleanings in Science*, Calcutta, pl. viii, fig. 10.
 1850. *Planorbis trochoideus* BENSON, *Annals and Magazine of Natural History*, London, ser. 2, V, p. 352.
 1876. *Planorbis Trochoideus* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 18, pl. xxxix, fig. 4-6.
 1878. *Planorbis trochoideus* SOWERBY, *Monograph of the Genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, London, XX, pl. ix, fig. 70.
 1878. *Planorbis (Segmentina) trochoideus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 44.
 1886. *Planorbis trochoideus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., Nürnberg, XVII, p. 225, No. 247.
 1915. *Planorbis (Segmentina) trochoideus* PRESTON, *Fauna of British India : Mollusca [Freshwater Gasterop. and Pelecypoda]*, London, p. 125, No. 253.
 1918. *Planorbis trochoideus* ANNANDALE, *Records Indian Museum*, XIV, Calcutta, p. 113.

¹ Les premiers tours, très petits sont, en dessus, bien enfoncés.

² Dans sa diagnose originale, W. H. BENSON (*loc. supra cit.*, 1850, p. 350) écrit : "... anfr. 2^o, ultimo medio obtuse angulata ...", ce qui est peu exact, la carène étant toujours nettement *inframédiane*. A cet égard, la figuration donnée par S. HANLEY et W. THEOBALD (*loc. supra cit.*, 1876, pl. xl, fig. 4) est parfaitement fidèle.

LOCALITÉS :

Indes anglaises ; Belgaum [Collect. W. T. BLANFORD] ; six exemplaires ; = Barrackpore [Collect. CANTOR, et Collect. *Asiatic Society of Bengal*] ; neuf exemplaires ; = Madras [Collect. G. NEVILL.] ; = Ceylan : Balapiti, Port Canning [Collect. G. NEVILL.]

: vivant dans le Inlé Lake et subfossile dans les dépôts lacustres de la plaine du He-Ho (province de Yawnghwe, sur le Shan Plateau, vers 900 mètres d'altitude) [N. ANNANDAIA] ; nombreux exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est spéciale à l'Inde péninsulaire et à l'île de Ceylan.

Coquille très petite (diamètre maximum : $2\frac{1}{2}$ millimètres ; hauteur : 1 millimètre), à tours de spire *très embrassants*, le dernier formant presque toute la coquille, muni d'une carène subbasale médiocrement accentuée ; ombilic ponctiforme (indice ombilical : 7).

Test vitrinoïde, absolument transparent, corné très clair, parfois un peu rougeâtre, garni de stries longitudinales extrêmement fines et délicates, serrées et très peu obliques.

Cette espèce ressemble au *Segmentina sindica* Benson, mais elle s'en distingue par sa forme un peu moins élevée, par son ombilic plus franchement ponctiforme et par sa carène subbasale et non inframédiane.

Segmentina umbilicalis Benson.

Pl. II, fig. 19, 20 et 21.

- 1830. *Planorbis umbilicalis* BENSON, *Journal Asiatic Society of Bengal*, V, p. 741.
- 1850. *Planorbis umbilicalis* BENSON, *Annals and Magazine Natural History*, London, 2^e ser., V, p. 341.
- 1867. *Planorbis umbilicalis* MARTENS, *Malakozoolog. Blätter*, XIV, p. 216.
- 1876. *Planorbis umbilicalis* HANLEY et THEOBALD, *Conchologia Indica*, London, p. xviii et p. 18, pl. xl, fig. 7-8-9.
- 1878. *Planorbis umbilicalis* SOWERBY, Monograph of the genus *Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. x, fig. 77a-77b.
- 1878. *Planorbis* (*Segmentina*) *umbilicalis* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 246, No. 45.
- 1884. *Planorbis Dorrianus* WATTELED, *Journal de Conchyliologie* XXXII, p. 126, No. 2.
- 1886. *Planorbis umbilicalis* CLESSIN, *Die Familie der Limnæiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed. Nürnberg XVII, p. 136, No. 111, taf. xv, fig. 6.
- 1910. *Planorbis* (*Hippeutis*) *umbilicalis* BAVAY et DAUTZENBERG, *Journal de Conchyliologie*, LVIII, p. 18-19.
- 1915. *Planorbis* (*Segmentina*) *umbilicalis* PRESTON, *Fauna of British India: Mollusca*, [*Freshwater Gasterop. and Pelecypoda*], London, p. 125, No. 252.

LOCALITÉS :

Indes anglaises : Sylhet [Collect : *Asiatic Society of Bengal*]; 2 exemplaires; = Assam [DR. T. OLDHAM]; vingt exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

En dehors de l'Inde et de Ceylon, où sa répartition géographique exacte est encore bien peu connue, cette Segmentine vit en Cochinchine, "dans les mares des environs d'Hanoï et sans doute ailleurs en compagnie de *Planorbis saigonensis* de *Pl. confusus*¹ et de *Planorbis (Segmentina) dicoelus*² Morelet."³ Elle est également connue en Chine, notamment aux environs de Shanghai et dans les régions chinoises du Nord [HOHENACKER, in : Collect. W. DUNKER, *Mus. Berolin.*, cf. : S. CLESSIN, in : MARTINI et CHEMNITZ, *loc. supra cit.*, 1886, p. 136].

L'Iconographie donnée par S. CLESSIN (*loc. supra cit.*, 1886, taf. xv, fig. 6) est peu exacte : la figure au trait représentant le profil de la coquille est tout à fait erronée. Celle de S. HANLEY et W. THEOBALD *loc. supra cit.*, 1876, pl. xl, fig. 7) est beaucoup plus fidèle et correspond bien au type moyen. La carène du dernier tour y est représentée un peu inframédiane, ce qui est le cas général ; cependant, chez quelques rares individus, elle est presque médiane. Normalement assez aiguë, elle devient parfois plus ou moins obsolette.

Les dimensions varient entre 6 et 7 millimètres de diamètre maximum pour $1\frac{1}{8}$ à $1\frac{1}{4}$ millimètres de hauteur maximum. Le DR. E. von MARTENS a signalé des exemplaires de Chine (sans localité précise) atteignant $8\frac{1}{2}$ millimètre de diamètre maximum, 6 millimètres de diamètre minimum et 2 millimètres de hauteur.⁴ L'indice ombilical est de 23.

Le test est léger, d'un corné clair très brillant, parfois même irisé, presque transparent ; il est, en dessus et en dessous, très finement strié (stries irrégulières, bien onduleuses et assez obliques).

A. BAVAY et PH. DAUTZENBERG ont montré que le *Planorbis*

¹ Rappelons que le *Planorbis confusus* De Rochebrune, est synonyme du *Planorbis saigonensis* Crosse et Fischer.

² Le *Segmentina dicreta* a été décrit par A. MORELET dans le *Journal de Conchyliologie* (Vol. XII, 1865, p. 226) sous le nom d'*Helix dicoela*. Le même auteur a figuré plus tard cette espèce dans ses *Séries Conchyliologiques* . . . 4^e livraison : *Indo-Chine*, Paris, 1875, p. 276, No. 43, tab. xii, fig. 8 (*Planorbis dicoelus*).

³ BAVAY (A.) et DAUTZENBERG (PH.), Contributions à la faune fluviatile de l'Extrême-Orient (Inde et Indo Chine), *Journal de Conchyliologie*, LVIII, 1910, p. 19. Les auteurs ajoutent que le "[*Planorbis umbilicalis* Benson] est à peu près de même taille que le *Planorbis dicoelus* et il est assez difficile de les distinguer l'un de l'autre si l'on ne tient pas compte de l'absence des plis internes chez le premier tandis que le second en est pourvu et les laisse voir par transparence . . ." En raison de cette absence de plis, A. BAVAY et PH. DAUTZENBERG classent l'espèce de W. H. BENSON dans le sous-genre *Hippautis*. Je ne suis pas de cet avis et je pense que les lamelles internes ont été résorbées chez cette Segmentine comme on l'observe, d'ailleurs, assez fréquemment.

⁴ MARTENS (DR. E. von), Ueber die ostasiatischen Limnaeaceen, *Malakozoolog. Blätter*, XIV, 1867, p. 217.

Dorri Wattebled [= *Planorbis Dorrianus*] était synonyme du *Planorbis umbilicalis* Benson.¹

Segmentina papyracea Benson.

1842. *Planorbis papyraceus* BENSON, *Annals and Magazine of Natural History*, London, IX, p. 487.
 1855. *Planorbis papyraceus* BENSON, *Journal Asiatic Society of Bengal*, XXIV, p. 124.
 1867. *Planorbis papyraceus* MARTENS, *Malakozoolog. Blätter*, XIV, p. 217.
 1878. *Planorbis* (?) *papyraceus* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, 245, No. 38B.

LOCALITÉ:

Chine: Ile Chusan [Collect. CANTOR, ex DAMON]; deux exemplaires; No. 64.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce n'a pas été signalée depuis W. H. BENSON.

Un des exemplaires du Musée de Calcutta est brisé; l'autre présente les caractères suivants:

Coquille très aplatie, subconvexe en dessus, avec une partie centrale presque plane (premiers tours enroulés très sensiblement sur un même plan), à peine subconvexe en dessous avec un ombilic moyennement élargi, peu profond; spire composée de 4 tours convexes séparés par des sutures profondes, à croissance d'abord assez régulière, puis beaucoup plus rapide; dernier tour très grand formant, à lui seul, près des $\frac{3}{4}$ de la coquille en dessus, près des $\frac{3}{4}$ en dessous, à peu près aussi convexe en dessus qu'en dessous, dilaté à l'extrémité et muni d'une carène médiane filiforme très saillante; ouverture oblique, cordiforme transverse, très anguleuse extérieurement au point où aboutit la carène, à bords marginaux convergents mais éloignés.

Diamètre maximum: $11\frac{1}{4}$ millimètres; diamètre minimum: $9\frac{1}{2}$ millimètres; épaisseur maximum: $2\frac{1}{4}$ millimètres; hauteur de l'ouverture: $4\frac{1}{2}$ millimètres; diamètre de l'ouverture: 5 millimètres. Indice ombilical: 27.

Test mince, très léger, fragile, transparent, corné clair peu brillant; stries longitudinales très fines et délicates, obliques et serrées en dessus, encore plus fines, à peine visibles en dessous.

Il est impossible de considérer le *Segmentina papyracea* Benson comme spécifiquement distinct du *Segmentina umbilicalis* Benson. Il en constitue une variété *major* en différant, en dehors de la taille:

Par sa forme proportionnellement plus aplatie; par son dernier tour aussi convexe en dessus qu'en dessous alors qu'il est, en général, chez le *Segmentina umbilicalis* Benson, plus convexe en dessus qu'en dessous; par la carène de son dernier tour plus

¹ BAVAY (A.) et DAUTZENBERG (PH.), *loc. supra cit.*, LVIII, 1910, p. 19.

médiane ;¹ par son ombilic notablement plus élargi ;² enfin par son test moins brillant.³

Genre *Planorbula* Haldeman, 1840.

- 1880. *Discus* HALDEMAN, *A Monograph Limniades and other Fresh water Shells North America*, I, p. 4 de la couverture (type : *Planorbis armigerus* Say) [non *Discus* FITZINGER, 1833] (Juillet 1840).
- 1840. *Planorbula* HALDEMAN, *loc. supra cit., suppl. to part I*, p. 2 (Octobre 1840).
- 1842. *Planorbula* HALDEMAN, *loc. supra cit.*, IV, p. 14.
- 1847. *Dentalus* GRAY, *Proceedings Zoological Society of London*, p. 181 (non BECK, 1837) [type : *Planorbis armatus* GRAY = ? *Planorbis armigerus* Say + *Planorbis armiger* Beck].
- 1855. *Planorbula* H. et A. ADAMS, *Genera of recent Mollusca, etc.* . . , London, II, p. 265.
- 1865. *Planorbula* BINNEY, *Land and Fresh Water Shells North America*, II, p. 136.
- 1874. *Planorbulina* JICKELI, *Fauna der Land-und Süßwasser Mollusk. Nord-Ost-Afrik.*, Dresden, p. 221 (pour le *Planorbis alexandrinus* Ehrenberg [*Segmentina* sous-genre *Planorbulina*]).
- 1880. *Planorbula* FISCHER et CROSSE, *Etude Mollusques terr. fluviat. Mexique et Guatemala*, II, Paris, p. 76.
- 1886. *Planorbula* CLESSIN, Die Familie der Limnaeiden, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., Nürnberg, XVII, p. 35a, No. 13 [*Planorbis* sous-genre *Planorbula*].
- 1899. *Planorbula* MARTENS, *Land and Freshwater Mollusca (Biologia Centrali-Americana*, London) p. 398 [*Planorbis* sous-genre *Planorbula*] (Avril 1899).
- 1905. *Planorbula* DALL, *Land and Freshwater Mollusks of Alaska (Harriman Alaska Expedition*, XIII, New-York), p. 97 [*Segmentina* sous-genre *Planorbula*].

Les Planorbules ont, comme les Segmentines, une armature aperturale comprenant, typiquement, six lamelles :

Une *lamelle sigmoïde* ; une *lamelle pariétale*, obliquement enfoncée et souvent munie d'un petite denticulation en forme de tubercule située à sa base ; une *lamelle basale*, transverse ; une *lamelle externe* (située près du bord externe de l'ouverture), obliquement enfoncée, surmontée d'une autre *lamelle transverse* ; enfin, sur le bord supérieur, une *lamelle supérieure*, petite et assez profondément enfoncée.

La disposition de ces lamelles peut présenter quelques variations : c'est ainsi que chez le *Planorbula Whealleyi* Lea les lamelles sont toutes plus fortement développées et plus largement incurvées. Cependant, dans tous les cas, la disposition fondamentale reste la même.

Les lamelles des Planorbules peuvent se résorber plus ou moins complètement et il ne reste souvent, chez les individus bien adultes, qu'une seule denticulation. Mais, *contrairement à ce qui*

¹ Chez le *Segmentina umbilicalis* Benson la place de la carène est d'ailleurs très variable : elle est tantôt inframédiane, tantôt médiane, ces deux modalités étant réunies par tous les intermédiaires.

² Indice ombilical du *Segmentina papyracea* Benson : 27 ;—du *Segmentina umbilicalis* Benson : 23.

³ Il est généralement d'un corné clair très brillant, parfois même irisé chez le *Segmentina umbilicalis* Benson.

existe chez les *Planorbes*, toutes les *Planorbules* ont, au cours de leur développement, un système complet de denticulations aperturales.

La coquille des *Planorbules* ressemble tout à fait à celle des *Planorbes*, cependant elle montre toujours, du moins chez les adultes, un bourrelet apertural interne qui manque souvent chez les *Planorbes*.

Type : *Planorbis armigerus* Say.

Les *Planorbules* habitent les eaux douces de l'Amerique et de l'Afrique tropicale.

§ I.

Planorbula armigera Say.

- 1818. *Planorbis armigerus* Say, *Journal Academy natur.-sciences Philadelphia*, II, p. 164.
- 1837. *Planorbis armiger* BECK, *Index Molluscorum*, p. 123.
- 1841. *Planorbis armigerus* GOULD, *Report on the Invertebrata of Massachusetts*, p. 205, fig. 138.
- 1843. *Planorbis armigerus* DE KAY, *Zoology of New-York, part V, Mollusca*, p. 62, pl. iv, fig. 64a-64b-64c.
- 1844. *Planorbula armigerus* HALDEMAN, *Monograph of the Limniades and other Fresh Water univalve Shells*, p. 30, pl. iv, fig. 11 à 13.
- 1855. *Segmentina armigera* ADAMS, *Genera of recent Mollusca*, II, p. 264, pl. lxxiv, fig. 4.
- 1859. *Planorbula armigera* CHENU, *Manuel de Conchyliologie*, I, Paris, p. 483, fig. 3570.
- 1865. *Segmentina armigera* BINNEY, *Land and Freshwater Shells North America*, part II, p. 137, fig. 228-229.
- 1878. *Planorbis (Planorbula) armigera* NEVILL, *Handlist Mollusca, Indian Museum Calcutta*, p. 243, No. 18.
- 1878. *Planorbis armigerus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REVE, *Conchologia Iconica*, London, XX, pl. - , fig. 18.
- 1886. *Planorbis armigerus* CLESSIN, *Die Familie der Linnæiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 121, No. 89, taf. xx; fig. 10.
- 1905. *Segmentina (Planorbula) armigera* DALI, *Land and Freshwater Mollusks of Alaska*, p. 98, fig. 76.
- 1907. *Segmentina armigera* BRYANT WALKER, *The Nautilus*, XX, pl. vii, fig. 1 à 3.

LOCALITÉS :

Etats-Unis : Etats de New-York et de Michigan [Prof. W. NEWCOMB ; = Rev. E. R. BEADLE] ; 26 exemplaires.

Canada : Ile du Prince Edouard [Collect. A. NEVILL] ; 5 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Très caractéristique de la faune potamique de l'Amérique du Nord, le *Planorbula armigera* Say vit au Canada, dans toute la région moyenne des Etats-Unis (depuis la Géorgie du Sud) et s'étend, au Nord, jusqu'au Great Slave Lake. Mais il n'existe pas à l'ouest des montagnes Rocheuses, sur le versant pacifique des Etats Unis, où il est remplacé par une espèce représentative, le *Planorbula declivis* Tate.¹ Ce dernier n'a pas encore été trouvé

¹ TATE (R.), *American Journal of Conchology*, V, 1870, p. 159.

au nord de l'Umpqua River (Oregon); par contre il s'avance vers le sud jusqu'à San Agustín près de Acoyupa (Nicaragua) où il vit en compagnie du *Planorbis cultatrus* d'Orbigny [R. TATE¹].

Le *Planorbula armigera* Say atteint de 7 à 8 millimètres de diamètre maximum et 3 millimètres de hauteur. Le test présente de fines stries longitudinales coupées de stries spirales obsolètes *peu nombreuses*, seulement visibles au microscope. Cette sculpture est plus fortement accentuée, *nettement réticulée*,² chez une espèce voisine, le *Planorbula Christyi* Dall³ qui atteint jusqu'à 10 millimètres de diamètre maximum et 3 millimètres de hauteur.⁴

D'autre part BRYANT WALKER a décrit un *Planorbula crassilabrum*,⁵ espèce vivant dans les états de Michigan [BRYANT WALKER], et de l'Indiana [Bryant Walker, Prof. F. M. WITTER], voisine du *Planorbula armigera* Say mais s'en distinguant :

Par sa taille plus petite et sa forme relativement plus haute (3 millimètres de hauteur pour seulement 7½ millimètres de diamètre maximum); par son ombilic plus petit et plus profond; enfin par l'angulosité beaucoup plus prononcée du dernier tour en dessous (autour de l'ombilic). Ces caractères sont encore plus accentués chez le *Planorbula Wheatleyi* Lea,⁶ si bien que du point de vue de la morphologie externe, le *Planorbula crassilabrum* Bryant Walker est intermédiaire entre l'espèce de SAY et celle de I. LEA.⁷ Par contre, les denticulations de l'ouverture diffèrent davantage, celles du *Planorbula crassilabrum* Bryant Walker étant les plus éloignées du type d'armature aperturale observé chez le *Planorbula armigera* Say. C'est pour de telles espèces, chez lesquelles le système de lamelles et de denticulations atteint son maximum de complexité, que W. H. DALL a établi le sous-genre HALDEMANINA.⁸ Remarquons, cependant, que l'ornementation aperturale étant, chez toutes ces espèces, construite sur le même modèle, la valeur du sous-genre *Haldemanina* est assez contestable.⁹

¹ TATE (R.), *loc. supra cit.*, V, 1870, p. 159.

² Chez le *Planorbula Christyi* Dall la surface du test est couverte de stries longitudinales fines coupées de stries spirales également fines réparties sur toute la surface des tours de spire.

³ DALL (W. H.), *Land and Fresh Water Mollusks of Alaska and adjoining regions, Harriman Alaska Expedition*, Vol. XIII, New-York, 1905, p. 99, pl. ii, fig. 10-11 [*Segmentina* (*Planorbula*) *christyi*].

⁴ Cette espèce vit dans le Manitoba [R. MILLER CHRISTY] et dans la rivière Mackenzie [E. A. PREBLE].

⁵ WALKER (BRYANT), A new species of *Segmentina*, *The Nautilus*, XX, 1907, p. 122, pl. vii, fig. 4-6 (*Segmentina crassilabrum*); = *Segmentina Wheatleyi* WITTER, *Journal of Conchology*, I, 1878, p. 388; = *Segmentina Wheatleyi* BRYANT WALKER, *Revis. Moll. Michigan*, 1895, p. 18 [non *Planorbis Wheatleyi* LEA].

⁶ LEA (I.), *Journal Academy Natural Sciences of Philadelphia*, VI, 1866, p. 158, pl. xxiii, fig. 71; et : *Observations on the Genus Unio*, XI, 1856, p. 113, p. xxiii, fig. 71 (*Planorbis Wheatleyi*) [= *Segmentina Wheatleyi* BRYANT WALKER, *The Nautilus*, XX, 1907, p. 123, pl. vii, fig. 7-9].

⁷ Le *Planorbula Wheatleyi* Lea vit, aux États-Unis, dans le territoire de l'Alabam [A. A. HINKLEY et H. H. SMITH].

⁸ DALL (W. H.), *Land and Freshwater Mollusks of Alaska and adjoining regions, Harriman Alaska Expedition*, New York, 1905, p. 97 (type du sous genre : *Planorbis Wheatleyi* Lea).

⁹ Cette opinion est également celle de H. A. PILSBRY et J. H. FERRIS (Mol-

§ II.

Planorbula alexandrinensis Ehrenberg.

1831. *Planorbis Alexandrinus* EHRENBURG, *Symbol. physic., Mollusques*, No. 1.
 1866. *Planorbis alexandrinus* MARTENS, *Malakozoolog. Blätter*, p. 3.
 1872. *Planorbis alexandrinus* JICKELI, *Reisebericht*, p. 11.
 1874. *Segmentina alexandrina* JICKELI, *Fauna d. Land- und Süssw.-Mollusken Nord-Ost-Afrik.*, Dresden, p. 221, taf. vii, fig. 25 à 25f.
 1876. *Planorbula Jickelii* BOURGUIGNAT, *Classif. familles, genres syst. europ.*, *Bulletin soc. sciences phys. natur. Bordeaux*, p. 80 (à part, p. 36).
 1878. *Planorbis alexandrinus* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, pl. xiv, fig. 115a-115b.
 1880. *Planorbis alexandrinus* KOBELT, *Iconographie der Land- und Süswasser-Mollusken*, fig. 1986.
 1884. *Planorbula alexandrina* INNÈS, *Bulletins Société Malacologique France*, I, p. 344.
 1886. *Planorbis alexandrinus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed., XVII, Nürnberg, p. 120, No. 88, taf. xx, fig. 9.
 1898. *Planorbula alexandrina* POLLONERA, *Bollettino . . . Musei anatom. compar. di . . . Torino*, XIII (4 Mars), p. 11.
 1909. *Planorbis alexandrinus* PALLARY, *Mémoires Institut Egyptien*, Le Caire, VI, fasc. I, p. 55.

LOCALITÉS :

Egypte : Le Caire [DR. BLOCH] ; un exemplaire (variété *undentata*) ; No. M ^{11.1.2} ; = Damiette [SCHRODER] ; un exemplaire ; No. ^{11.1.3}.

DISTRIBUTION GÉOGRAPHIQUE.

Presque toute l'Egypte, principalement la Basse Egypte. Ce *Planorbula* vit également dans l'Erythrée italienne [Général DE BOCCARD] en compagnie d'une espèce voisine, le *Planorbula Boccardi* Pollonera.¹

" Je connais du Nil, des canaux ou des lacs de ce pays, cinq Planorbules : la *Jickelii* (Bourg.) espèce que Jickeli (Moll N. O. Afrik., pl. vii, fig. 25, 1874) a confondue avec le *Planorbis alexandrinus* d'Ehrenberg, et les *chauiodius*, *odontostoma*, *calliodus* et *Letourneuxi* (Bourguignat). "

Anisi s'exprime J. R. BOURGUIGNAT en 1876² et, en 1884,

lusca of the Southwestern States, II, *Proceedings Academy of Natural Sciences of Philadelphia*, 1906, p. 166).

¹ POLLONERA (CARLO), *Molluschi terrestri e fluviali dell' Eritrea raccolti dal Generale di Boccard*, *Bollettino d. Musei d. Zoologia ed Anatomia comparata d. R. Università di Torino*, XIII, No. 313, 4 Mars 1898, p. 11, tav. i, fig. 22, 23, 24 et 25.

Cette espèce diffère du *Planorbula alexandrinensis* Ehrenberg par ses tours de spire à croissance plus rapide, sa cavité ombilicale supérieure plus large et plus profonde et sa cavité ombilicale inférieure entourée d'une angulosité beaucoup plus faible, presque nulle.

² BOURGUIGNAT (J. R.), *Description de deux nouveaux genres Algériens, suivies d'une classification des familles et des genres de Mollusques terr. et fluvial du Système européen*, *Bulletin Société sciences phys. et natur. Bordeaux*, 1876, p. 80 (tirés à part, p. 36).

WALTER INNES énumère treize Planorbules égyptiennes, nommées par J. R. BOURGUIGNAT, mais qui n'ont jamais été décrites. Ce sont, en dehors du *Planorbula alexandrinensis* Ehrenberg, les *Planorbula Aegyptiaca* Bourguignat, *Pl. Jickelii* Bourguignat, *Pl. calliodon* Bourguignat, *Pl. odontostoma* Bourguignat, *Pl. Chauliodon* Bourguignat, *Pl. Letourneuxi* Bourguignat, *Pl. microstoma* Bourguignat, *Pl. diodontia* Letourneux, *Pl. Tanousi* Letourneux, *Pl. Chambardiana* Letourneux, *Pl. calveriana* Letourneux et *Pl. Cleopalrae* Letourneux.¹ Ces Planorbules sont restées inconnues, mais il est probable qu'elles appartiennent toutes au *Planorbula alexandrinensis* Ehrenberg.

En étudiant quelques unes de ces Planorbules—d'après des exemplaires provenant de J. R. BOURGUIGNAT,—P. PALLARY observe que les denticulations n'affectent, "dans certains cas, que des jeunes exemplaires du *Pl. Boissyi* = *aegyptiaca*," que celles-ci étaient résorbées par l'animal et qu'elles manquaient dans la coquille adulte comme nous nous en sommes assurés par des coupes transversales..."; "nous pouvons donc affirmer que la présence des denticulations dans les Planorbes égyptiens n'est qu'un état purement transitoire, marquant en quelque sorte un stade de développement ou peut être un cas pathologique et que ces lamelles ne persistent pas à l'état adulte."² Il n'y a qu'une part de vérité dans ces assertions. Tout d'abord les denticulations internes des Planorbules ne persistent jamais à l'état adulte, à l'exception d'une seule qui peut même, quelquefois, disparaître également. P. PALLARY n'a donc observé qu'un fait connu depuis fort longtemps : chez les *Planorbis* il n'y a jamais—à aucun stade du développement—de denticulations ; au contraire, chez les *Planorbula*, il existe un système de denticulations dirigées dans le sens spiral, denticulations qui, à l'exception d'une seule, disparaissent à l'état adulte. Mais, dans ce dernier cas, le péristome est toujours bordé, intérieurement, d'un fort bourrelet. Or, dans les colonies de *Planorbula alexandrinensis* Ehrenberg, il est habituel de rencontrer des individus chez lesquels les denticulations ont entièrement disparu, mais possédant un fort bourrelet apertural et qui, par convergence, ont assez souvent le même aspect extérieur que certains exemplaires du *Planorbis Boissyi* Potiez et Michaud.⁴ C'est sans doute ce qui explique l'erreur d'interprétation commise par P. PALLARY.⁶

¹ INNES (SIR WALTER), Recensement des Planorbes et des Valvées de l'Égypte, *Bulletins Société Malacologique France*, I, Décembre 1884, pp. 344-345.

² Cette assimilation est une erreur : le *Planorbis Boissyi* Potiez et Michaud est un vrai Planorbe (sous-genre *Planorbis* sensu stricto) ; le *Planorbis aegyptiacus* Bourguignat est un *Planorbula*.

³ PALLARY (P.), Catalogue de la Faune Malacologique de l'Égypte ; *Mémoires Institut Égyptien*, Le Caire, VI, fasc. I, Novembre 1909, p. 59.

⁴ J'ai signalé ce même phénomène de convergence chez deux espèces du lac Tchad : *Planorbis (Planorbis) Bridouxii* Bourguignat et *Planorbula tchadiensis* Germain.

⁶ P. PALLARY ajoute (*loc. supra cit.*, Le Caire, 1909, p. 59, note 1) qu'aucune forme de Planorbule ne dépasse 9 millimètres de grand diamètre. Cette assertion est peu conforme à la réalité, même en la restreignant à l'Égypte, comme P. PALLARY l'a fait par la suite *ibid.*, *additions et corrections*, Le Caire, p. 128).

Des deux exemplaires de cette espèce appartenant au Musée de Calcutta l'un a justement, toutes ses denticulations résorbées et son ouverture est fortement bordée d'un bourrelet blanc interne. Le test est solide, recouvert d'un épiderme brun, et garni de fines stries longitudinales obliquement onduleuses, inégales et serrées, légèrement plus fines et beaucoup moins onduleuses en dessous. Il mesure $9\frac{1}{2}$ millimètres de diamètre maximum, $7\frac{1}{8}$ millimètres de diamètre minimum et $3\frac{1}{2}$ millimètres de hauteur. L'autre individu est de taille un peu plus faible : $8\frac{3}{4}$ millimètres de diamètre maximum, 7 millimètres de diamètre minimum et 3 millimètres de hauteur. Son test est solide, un peu épais, d'un jaune-succiné assez brillant. Son ouverture, munie d'un très fort bourrelet interne blanc, montre en outre une dent columellaire médiane profondément enfoncée, bien saillante, dirigée dans le sens spiral.

Sous Famille des *POMPHOLYGINAE*.

Genre *Pompholyx* Lea, 1856.

- 1856. *Pompholyx* LEA, *Proceedings Academy Natural Sciences Philadelphia*, VIII, p. 80.
- 1857. *Pompholyx* LEA, *Journal de Conchyliologie*, VI, Paris [2^e série, II], p. 208.
- 1865. *Pompholyx* BINNEY, *Land and Fresh-water Shells of North America*, II, Washington, p. 73.
- 1870. *Pompholyx* DALL, *Annals of the Lyceum of Natur. History of New-York*, IX (Mars 1870), p. 334 et p. 353.
- 1886. *Pompholyx* CLESSIN, *Die Familie der Linnæiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*. 2^e Edit., XVII, Nürnberg, p. 226.

Le genre *Pompholyx* a été créé par I. LEA pour un très curieux Gastéropode de Californie décrit sous le nom de *Pompholyx effusa* Lea

L'animal se sépare de celui des Planorbes par quelques caractères assez importants. Les tentacules sont courts, gros, cylindriques, faiblement globuleux à leur extrémité;¹ les quex sont sessiles et placés sur la tête tout près de la base interne des tentacules, mais non sur les tentacules mêmes comme chez les Planorbes; le pied est court et brusquement arrondi postérieurement; enfin il n'y a qu'une seule mâchoire subcordiforme.² W. H. DALL a donné d'intéressants détails sur l'anatomie d'une espèce (*Pompholyx solida* Dall) également recueillie en Californie.³

La coquille des *Pompholyx* est de forme déprimée globuleuse; elle ne compte qu'un petit nombre de tours de spire, le dernier étant très grand et ventru; l'ouverture est oblique, très large, subcirculaire; enfin il n'existe pas d'ombilic.

Les *Pompholyx* sont des animaux peu répandus. Ils sont seulement connus d'un petit nombre de localités de la Californie et de la Colombie orientale.

Pompholyx effusa Lea.

- 1856. *Pompholyx effusa* LEA, *Proceedings Academy Natural Sciences of Philadelphia*, VIII, p. 80.
- 1857. *Pompholyx effusa* LEA, *Journal de Conchyliologie*, Paris, VI (2^e série, ii), p. 208.
- 1858. *Pompholyx effusa* ADAMS, *Genera of Recent Mollusca*, II, p. 645. pl. cxxxviii, fig. 11.
- 1865. *Pompholyx effusa* BINNEY, *Land and Fresh water Shells of North America*. II, p. 74, fig. 119.

¹ Les tentacules sont, au contraire, élançés et filiformes chez les *Planorbis*.

² Par suite de la présence de deux plaques latérales accessoires, la mâchoire des *Planorbis*—et aussi celle des *Linnæes*—est formée de trois pièces que l'on a parfois considérées comme trois mâchoires.

³ DALL (W. H.). On the genus *Pompholyx* and its allies, with a revision of the *Linnæidas* of authors, *Annals of the Lyceum of Natural History of New York*, IX, New-York, 1870 (anatomie du *Pompholyx solida* Dall, pp. 336-340, fig. 1, p. 344, et pl. ii, fig. 1 à 9).

1866. *Pompholyx effusa* DALL, *Proceed. Californ. Academy of Sciences*, p. 266, fig. 28.
 1870. *Pompholyx effusa* BINNEY et BLAND, *Annals of the Lyceum of Natural History of New-York*, IX, p. 250, fig. 9 (radula).
 1870. *Pompholyx effusa* DALL, *Annals of the Lyceum of Natural History of New-York*, IX, p. 334 et p. 353.
 1872. *Pompholyx effusa* TRYON, *Monograph Freshwater Univalve Mollusca United States*, p. 174, pl. xviii, fig. 12 à 14.
 1878. *Pompholyx effusa* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 240, No. 1.
 1886. *Pompholyx effusa* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ. *Systemat. Conchylien-Cabinet*, 2^e Edit., XVII, Nürnberg, p. 226, No. 1, taf. xxxiii, fig. 5.
 1918. *Pompholyx effusa* BRYANT WALKER, *Synopsis Fresh-Water Mollusca North America, University of Michigan, Miscellaneous Publications No. 6, Michigan*, p. 14, fig. 38-39.

LOCALITÉ :

Etats-Unis : Etat de Nevada, sans indication précise de localité [un exemplaire : Prof. W. NEWCOMB ; = un exemplaire : Prof. E. C. STEARNS].

Le coquille de cette espèce reste toujours de taille assez petite : 11 à 13 millimètres de diamètre maximum pour 9-10 millimètres de hauteur. L'ouverture atteint de 9 à 11 millimètres de hauteur sur 8 à 9 millimètres de diamètre.

Le test est assez mince, peu solide, d'un corné rougeâtre ou brun, plus rarement olivâtre, subtransparent et à peine brillant. Il est garni de stries longitudinales assez fines, serrées, obliquement subonduleuses, inégales, peu régulièrement espacées, plus fortes et plus irrégulières près du péristome. L'intérieur de l'ouverture est d'un blanc brillant légèrement bleuté.

***Pompholyx solida* Dall.**

1870. *Pompholyx* variété *solida* DALL, *Annals of the Lyceum of Natural History of New-York*, IX, p. 335, pl. ii, fig. 1 à 7 et fig. i, p. 344 (radula).
 1878. *Pompholyx effusa* variété *solida* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 240.
 1918. *Pompholyx solida* BRYANT WALKER, *Synopsis Fresh-Water Mollusca North America, University of Michigan, Miscellaneous Publications No. 6, Michigan*, p. 105.

LOCALITÉ :

Etats-Unis : Etat de Nevada, sans indication précise de localité [un exemplaire : Prof. W. NEWCOMB ; = un exemplaire : Prof. E. C. STEARNS].

DISTRIBUTION GÉOGRAPHIQUE :

Ce *Pompholyx* vit dans les régions occidentales de l'état de Colombie.

Coquille de forme générale globuleuse élevée ; premiers tours de spire très proéminents ; dernier tour très ventru globuleux,

largement atténué en dessous ; ouverture aussi haute que large, irrégulièrement ovale, un peu anguleuse en bas, subanguleuse extérieurement.

Diamètre maximum : $21\frac{1}{2}$ millimètres, hauteur maximum : $19\frac{1}{4}$ millimètres ; hauteur de l'ouverture : 14 millimètres ; diamètre de l'ouverture : 14 millimètres.¹

Test solide, assez épais.

Ce *Pompholyx* diffère du *Pompholyx effusa* Lea par ses premiers tours de spire plus élevés, proéminents² ; par son dernier tour proportionnellement moins élargi et par son test beaucoup plus épais et solide.

"The specimens in question," ajoute W. H. DALL,³ "are clearly not *P. effusa*, yet in the absence of typical specimens of *P. leana* it still remains doubtful whether they belong to the latter species. Messrs. Adams' description answers pretty well, except that my specimens, instead of being thinner, are much more solid than the *effusa*. I propose, therefore, to indicate the species as *Pompholyx Leana*, var *solida*, until more definite information be obtained."

¹ Ces mensurations sont données d'après la figure publiée par W. H. DALL. (On the genus POMPHOLYX and its allies, with a revision of the LIMNAEIDAE of authors. *Annals of the Lyceum of Natural History of New-York*, IX, New-York, 1870, pl. ii, fig. 7a).

² Les premiers tours sont, au contraire, aplatis et presque enroulés sur le même plan chez le *Pompholyx effusa* Lea.

³ DALL (W. H.). *loc. supra cit.* 1870, p. 335-336.

⁴ ADAMS (H. et A.). *Proceedings Zoological Society of London*, 1854, p. 434.

Genre *Carinifex* Binney, 1863.

- 1863. *Carinifex* BINNEY, *Smithsonian Check List Shells*.
- 1864. *Megastrophia* LEA, *Proceedings Academy Natural Science of Philadelphia*, Janvier 1864.
- 1865. *Carinifex* BINNEY, *Land and Freshwater Shells of North America*, II, Washington, p. 74.
- 1865. *Carinifex* BINNEY, *American Journal of Conchology*, I, p. 50, pl. vii, fig. 6-7.
- 1870. *Carinifex* DALL, *Annals of the Lyceum of the Natural History of New-York*, IX (Mars 1870), p. 353.

L'animal des *Carinifex* ressemble à celui des *Planorbis*, mais les tentacules sont plus courts et la mâchoire est, comme chez les *Pompholyx*, dépourvue de plaques latérales.

Le coquille est relativement haute et renflée ; la spire est formée de tours assez nombreux, anguleux et étagés, le dernier très grand, renflé en dessus, très rapidement atténué en dessous ; l'ouverture est triangulaire. En dessous la coquille, largement ombiliquée en entonnoir, rappelle celle des *Planorbis* appartenant aux sous-genres *Helisoma* et *Taphius*.

Les *Carinifex* vivent dans quelques lacs et rivières de la Californie et de l'Utah (Etats-Unis). Une espèce fossile du tertiaire de l'Etat de Nevada (Etats-Unis), le *Carrinifex Tryoni* Meck, a été prise pour type du sous-genre *Vorticifex* Meck ¹ [*Carinifex* (*Vorticifex*) *Tryoni* Meck].

Carinifex Newberryi Lea.

- 1858. *Planorbis Newberryi* LEA, *Proceedings Academy Natural Sciences of Philadelphia*, p. 41.
- 1865. *Carinifex Newberryi* BINNEY, *Land and Fresh-Water Shells of North America*, II, p. 74, fig. 120 à 122.
- 1865. *Megastrophia Newberryi* LEA, *Observations on the genus Unio*, XI, pl. xxiii, fig. 68.
- 1870. *Carinifex Newberryi* DALL, *Annals of the Lyceum of Natural History of New-York*, IX, p. 344, fig. ii (radula) et p. 353.
- 1872. *Carinifex Newberryi* TRYON, *Monogr. Fresh-water Univalve Mollusca of United States*, p. 214, pl. vii, fig. 20 à 24.
- 1878. *Planorbis Newberryi* SOWERBY, *Monograph of the genus Planorbis*, in : L. REEVE, *Conchologia Iconica*, XX, London, pl. x, fig. 81.
- 1878. *Carinifex Newberryi* NEVILL, *Handlist Mollusca Indian Museum Calcutta*, I, p. 240, No. 1.
- 1881. *Carinifex Newberryi* STEARNS, *Proceedings Academy Natural Sciences of Philadelphia*, XXXIII, p. 108, fig. 25 à 27.
- 1886. *Planorbis Newberryi* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Ed. XVII, Nürnberg, p. 158, No. 141, taf. xxiii, fig. 7 et 10.
- 1918. *Carinifex newberryi* BRYANT WALKER, *University of Michigan, Miscellaneous Publications No. 6*, p. 15, fig. 40-41.

¹ MECK (F. B.), in : DALL (W. H.), *On the genus Pompholyx and its allies, with a revision of the Limnaeidae of authors*; *Annals of the Lyceum of Natural History of New-York*, IX, New-York, 1870, p. 353.

LOCALITÉ :

Etats-Unis : Californie, sans indication précise de localité [Prof. W. NEWCOMB]; 4 exemplaires.

DISTRIBUTION GÉOGRAPHIQUE.

Cette curieuse espèce est connue seulement des Etats de Californie et de l'Utah. En California, elle a été signalée dans le Klamath Lake et la Canoe Creek [DR. J. S. NEWBERRY]; dans le Clear Lake [DR. VEATCH]; dans la rivière Pitt [DR. COOPER¹]; à Antioch [CARLTON]; dans la Livermore Valley, où elle a été recueillie fossile dans les collines au nord de Martin, près de Tassajara (Alameda Country) [DR. COOPER]; dans l'Owen's Valley [HEMPHILL], localité la plus sud où cette espèce ait été trouvée. Dans le territoire de l'Utah, elle existe, à l'état subfossile, dans les Wahsatch Mountains, près du lac Utah [DR. E. PALMER]. Une espèce différente, le *Carinifex (Vorticifex) Tryoni* Meek, vivait dès le tertiaire dans l'Etat de Nevada.²

Le *Carinifex Newberryi* Lea est fort variable. Le type décrit et figuré par I. LEA possède une spire à tours très étagés, le dernier très grand et fortement caréné en haut. En dessous, l'enroulement rappelle celui du *Planorbis (Helisoma) bicarinatus* Say, et la carène entourant l'ombilic est également très accentuée. Mais il existe des formes avec carènes émoussées et dernier tour beaucoup mieux arrondi; d'autres, au contraire, d'un galbe plus élevé, avec un dernier tour dont les carènes sont particulièrement saillantes.

E. A. SMITH a décrit, sous le nom de *Carinifex Ponsonbyi*³ une espèce certainement voisine⁴ et qui n'est probablement qu'une variété de celle de I. LEA dont elle diffère :

Par son test plus mince, plus fragile, d'une teinte olivâtre pâle plus claire, garni de stries plus fines; par sa spire à croissance plus rapide; par son dernier tour proportionnellement plus grand et bien plus largement dilaté à son extrémité; enfin par son ouverture plus nettement triangulaire. Le *Carinifex Ponsonbyi* Smith mesure 20 millimètres de diamètre maximum, 15 millimètre de diamètre minimum et 16 millimètres de hauteur.

Le test du *Carinifex Newberryi* Lea est relativement mince, assez fragile, d'un corné jaunâtre souvent teinté de verdâtre en dessous; la sculpture comprend, sur les tours embryonnaires des

¹ Le DR. COOPER, cite également, de cette localité, une variété *minor* Cooper *Carinifex Newberryi* var. *minor*].

² Voir ci dessus, p. 188.

³ SMITH (E. A.), Description of new species of *Carinifex* from California; *Proceedings Zoological Society of London*, 2 Novembre, 1875, p. 536-537 [*Carinifex ponsonbyi*], figuré à la page 539. Par suite d'une erreur de mise en pages, le *Carinifex Ponsonbyi* Smith est représenté, à la page 539, sous le nom de *Diala leithii* Smith, tandis que cette dernière espèce est figurée, à la page 537, sous le nom de *Carinifex ponsonbyi*. Le *Diala leithii* a également été décrit par E. A. SMITH, in: *Quarterly Journal of Conchology*, Vol. I, p. 150.

⁴ Le *Carinifex Ponsonbyi* Smith, dédié au malacologiste anglais J. H. PONSONBY, a été découvert en Californie par Lord WALSLINGHAM.

stries longitudinales fines, obliques et subégales, devenant fortes¹ très obliquement arquées, subégales, régulières et à peu près équidistantes aux tours suivants où elles sont coupées de stries spirales délicates, inégales et inégalement distribuées. Les stries longitudinales deviennent de nouveau plus fines et plus irrégulières au voisinage du dernier tour où elles présentent les caractères suivants :

(a) entre la suture et la carène supérieure elles sont fines, serrées, inégales, très obliquement onduleuses et coupées de stries spirales très tenues et espacées ;

(b) entre les carènes supérieure et inférieure elles sont fines, serrées, très irrégulières et très fortement onduleuses dans une direction subverticale ;

(c) enfin, en dessous de la carène inférieure, elles sont à peine atténuées et visibles presque jusqu'au fond de la cavité ombilicale. On distingue, en outre, quelques traces de stries spirales.

Le *Carinifex Newberryi* Lea mesure de 12 à 19 millimètres de diamètre maximum et de 10 à 14 millimètres de hauteur.² Le plus grand individu que j'ai examiné avait les dimensions suivantes :

Diamètre maximum : 19 millimètres ; diamètre minimum : 15 millimètres ; hauteur : 14 millimètres ; hauteur de l'ouverture : 15 millimètres ; diamètre maximum de l'ouverture : 10 millimètres.

¹ Elles ressemblent alors à de petites côtes.

² T. G. COOPER [The West Coast Fresh-water Univalves, *Proceedings Academy Natural Sciences of Philadelphia*, IV, 1870, p. 98] a signalé—sans indiquer de localité—une variété *minor* (*Carinifex newberryi* var. *minor*) [= *Carinifex newberryi minor* BRYANT WALKER, *Synopsis Fresh-Water Mollusca North America, University of Michigan, Miscellaneous Publications*, No. 6. *Michigan* 1918, p. 106].

Sous Famille des *CHOANOMPHALINAE*.

Genre *Choanomphalus* Gerstfeldt, 1859.

1859. *Choanomphalus* GERSTFELDT, *Ueber Land- und Süßwasser-Mollusken Sibiriens und des Amur-Gebietes*, Saint-Petersbourg, p. 527.
1862. *Choanomphalus* BOURGUIGNAT, *Spiculèges Malacologiques*, Paris, pp. 1-6.
1875. *Choanomphalus* W. DYBOWSKI, ¹ *Die Gasteropoden-Fauna des Baïkal-Sees*, *Mémoires Académie Sciences Saint-Petersbourg*, 7^e série, XX, p. 52.
1879. *Choanomphalus* CROSSE et FISCHER, *Journal de Conchyliologie*, XXVII, p. 160.
1885. *Choanomphalus* WESTERLUND, *Fauna der paläarct. region Binnenconchylien* V, p. 63.
1886. *Choanomphalus* CLESSIN, *Die Familie der Limnaeiden*, in : MARTINI et CHEMNITZ, *Systemat. Conchylien-Cabinet*, 2^e Édit., XVII, Nürnberg, p. 232.
1909. *Choanomphalus* LINDHOLM, *Mollusken*, in : KOROTNEFF, *Wissens. Ergebn. Zool. Exped. Baikal See*, IV, p. 8 et p. 93.

Les *Choanomphalus* sont des coquilles ayant l'aspect extérieur des *Valvata* de la faune européenne, mais se rapprochant surtout des *Carinifex* et des *Pompholyx* des eaux douces de l'Amérique du Nord. Ces animaux ont les mêmes caractères anatomiques que les Planorbes ; leurs œufs sont ordinairement placés dans l'entonnoir ombilical et recouverts d'une mince pellicule les protégeant.

Les *Choanomphalus* sont des PLANORBIDAE aberrants. Dans son travail sur les Mollusques recueillis au lac Baïkal par le Prof. A. KOROTNEFF, W. A. LINDHOLM a divisé les *Choanomphalus* en plusieurs sous-genres : ²

Choanomphalus sensu stricto. Type : *Choanomphalus Maacki* Gerstfeldt.

Achoanomphalus LINDHOLM, 1909. Type : *Choanomphalus amauronius* Bourguignat.

Sulcifer LINDHOLM, 1909. Type : *Choanomphalus Schrenckii* Dybowski.³

La valeur de ces sous-genres n'est d'ailleurs pas encore définitivement établie.

Les *Choanomphalus* ont été longtemps considérés comme étroitement localisés au lac Baïkal et à l'Angara aux environs

¹ Les matériaux étudiés par W. DYBOWSKI ont été recueillis par son frère, D. DYBOWSKI, dans le lac Baïkal.

² LINDHOLM (W. A.), *Die Mollusken des Baikal-Sees* (Gastropoda et Pelecypoda), *Wissenschaftliche Ergebnisse einer Zoologischen Expedition nach dem Baikal-See unter Leitung des Prof. A. KOROTNEFF in den Jahren 1900-1902*, Vol. IV, Kiew et Berlin, 1909, p. 9 et suiv.

³ DYBOWSKI (W.), *Die Gasteropoden-Fauna des Baikal-Sees*, Saint-Petersbourg, 1875, p. 60, taf. ii, fig. 27 à 33 ; et W. A. LINDHOLM, *loc. supra cit.*, 1909, p. 23.

DISTRIBUTION GÉOGRAPHIQUE.

Cette espèce est seulement connue du lac Baïkal où elle vit principalement entre 2 et 10 mètres de profondeur [D. DYBOWSKI, W. GODLEWSKI, A. KOROTNEFF].

De forme bien déprimée, cette espèce est dépourvue de toute trace de carène autour de l'ombilic.

L'exemplaire du Musée d'Histoire naturelle de Calcutta est de taille médiocre: 4 millimètres de diamètre maximum et 2 millimètres de hauteur, alors que les plus grands individus recueillis par A. KOROTNEFF atteignent 6½ millimètres de diamètre maximum, 5 millimètres de diamètre minimum et de 2½ à 3 millimètres de hauteur.¹ Le test est relativement mince, d'un corré grisâtre; il est garni de stries longitudinales assez serrées, médiocres, très inégales aux environs de l'ouverture et plus fines en dessous où elles sont coupées de rares stries spirales plus accentuées mais irrégulièrement distribuées.

§ II.

Choanomphalus japonicus Preston.

1916. *Choanomphalus japonicus* PRESTON, *Annals and Magazine of Natural History*, London, 8^e ser., XVII, p. 160, pl. ix, fig. 2, 2a-2c.
 1916. *Choanomphalus japonicus*, ANNANDALE, *Memoirs Asiatic Society of Bengal*, VI, Calcutta, p. 44.

LOCALITÉ :

Japon : Lac Biwa, assez commun sous les pierres, vers l'extrémité sud du lac [N. ANNANDALE]; nombreux exemplaires du type et de la variété *perstriatulus* Preston.

¹ Cf. LINDHOLM (W. A.), *loc. supra cit.*, Kiew et Berlin, 1909, p. 18.

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EXPLICATION DES PLANCHES.

PLANCHE I.

FIG. 1, 2 et 3.—*Planorbis (Pierosoma) Horni* Tryon.

Exemplaire provenant de la Sierra Nevada (Californie)
[Prof. E. C. STEARNS]; $\times 1, 25$.

FIG. 4, 5 et 6.—*Planorbis (Indoplanorbis) exustus* Deshayes.
Monstruosité dextrorsa Nevill; $\times 2$.

FIG. 7, 8 et 9.—*Planorbis (Indoplanorbis) exustus* Deshayes.
Le Tibet; $\times 2$.

FIG. 10, 11 et 12.—*Planorbis (Pierosoma) caribaeus* Pfeiffer.
Ile de Cuba; $\times 2$.

FIG. 13, 14 et 15.—*Planorbis (Pierosoma) affinis* Adams.
Ile de la Jamaïque; $\times 2$.

FIG. 16, 17 et 18.—*Planorbis (Tropicorbis) maya* Morelet.
Yucatan; cotype donné par A. MORELET; $\times 4$.



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Phototypes G. Chrois

PLANCHE II.

- FIG. 1, 2 et 3.—*Planorbis* (*Diplodiscus*) *hyptiocyclus* Benson.
Fort MacDonald, a Ceylon [F. L. LAYARD]; $\times 5$.
- FIG. 4, 5 et 6.—*Planorbis* (*Taphius*) *pronus* Martens.
Venezuela; *cotype* donné par le DR. E. von MARTENS;
 $\times 3$.
- FIG. 7, 8 et 9.—*Planorbis* (*Gyraulius*) *Montrouzieri* Gassies.
Nouvelle-Calédonie; *cotype*; $\times 5$.
- FIG. 10, 11 et 12.—*Planorbis* (*Gyraulius*) *nanus* Benson.
Pharping (Nepal) [R. HODGART]; $\times 5$.
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Ile Chusan (Chine) [DR. CANTOR]; $\times 3$.
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Ile de Cuba; $\times 4$.
- FIG. 19, 20 et 21.—*Segmentina* *umbilicalis* Benson.
Sylhet (Assam); $\times 5$.



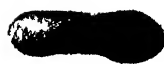
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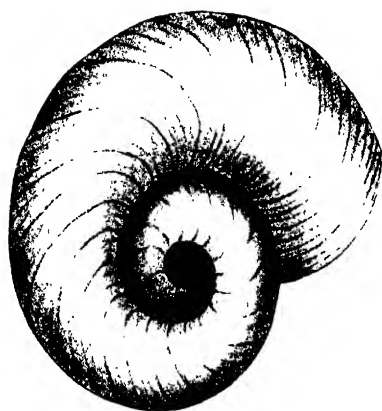
PLANCHE III.

FIG. 1, 2 et 3.—*Planorbis (Armiger) Annandalei* Germain.
Le Yarkand [DR. F. STOLICZKA]; *type*; $\times 25$.

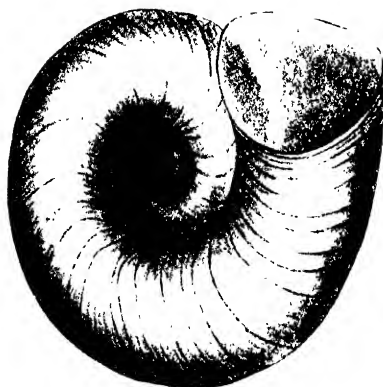
REC. IND. MUS., VOL. XXI, 1921.



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3

PLANORBIS (ARMIGER) ANNANDALEI Germain.

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